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BULLETIN OF WASHINGTON UNIVERSITY

**SCHOOL
OF MEDICINE**

1987/1988

ST. LOUIS, MISSOURI



POSTERO INFERIOR

LEFT PULMONARY ARTERY

LEFT ATRIUM

LEFT VENTRICLE

RIGHT ATRIUM

RIGHT VENTRICLE

Washington University School of Medicine is at the forefront in research and its clinical application. One area is in the School's Mallinckrodt Institute of Radiology; using 3-D magnetic resonance (MR) imaging—a non-invasive diagnostic technique—researchers have developed a way to see the heart in three dimensions. The system was first developed using computed tomography (CT scans) to help surgeons reconstruct deformities of the skull and face. Its developer, Michael W. Vannier, M.D., associate professor of radiology, adapted the system for cardiothoracic surgeons so that MR images of the heart can be seen before and after surgery. The MR images are reconstituted mathematically to reproduce the 3-D anatomy of a patient's heart. Color enhancement highlights important features, and the image can be rotated on a video screen to give surgeons a view from any angle. So far, at least 25 patients have benefitted from these extraordinary images; the greatest potential benefit is to children with congenital heart defects who may someday be spared the many invasive studies (such as cardiac catheterization) now needed to assess their cardiac status. Pictured on the cover are John Laschinger, M.D. (seated), a cardiothoracic surgery fellow who assisted in developing 3-D heart imaging, and William Filmyer, a medical student. The research team also includes James L. Cox, M.D., professor and chief of cardiothoracic surgery at Washington University School of Medicine.

BULLETIN OF WASHINGTON UNIVERSITY

St. Louis, Missouri

***School of Medicine
1987/1988***

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CALENDAR 1987-88

1987

JUNE

8 Monday Academic year begins for the Third and Fourth Year Classes.

12 Friday Deadline for registration and initial payment of tuition and fees for the Third and Fourth Year Classes.

9, Tuesday, National Board
10 Wednesday Examination, Part I.

JULY

3 Friday Independence Day observance.

18 Saturday End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.

AUGUST

24 Monday Academic year begins for the Second Year Class.

26 Wednesday Orientation, matriculation, and initial payment of tuition and fees for the First Year Class.

28 Friday Deadline for registration and initial payment of tuition and fees for the Second Year Class.

29 Saturday End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.

SEPTEMBER

7 Monday Labor Day observance.

9, Wednesday, National Board
10 Thursday Examination, Part I.

29, Tuesday, National Board
30 Wednesday Examination, Part II.

OCTOBER

10 Saturday End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.

NOVEMBER

13 Friday First trimester ends for the Second Year Class.

16 Monday Second trimester begins for the Second Year Class.

20 Friday First trimester ends for the First Year Class.
Deadline for payment of the balance of tuition and fees for the Third and Fourth Year Classes.

21 Saturday End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.

23 Monday Second trimester begins for the First Year Class.

26 Thursday Thanksgiving Day observance.

27 Friday Holiday for First and Second Year Classes.

DECEMBER

19 Saturday Winter recess begins at 1 p.m.

1988

JANUARY

4 Monday Winter recess ends at 8 a.m.

16 Saturday End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.

22 Friday Deadline for payment of the balance of tuition and fees for the Second Year Class.

29 Friday Deadline for payment of the balance of tuition and fees for the First Year Class.

FEBRUARY

19	Friday	Second trimester ends for the Second Year Class.
22	Monday	Third trimester begins for the Second Year Class.
26	Friday	Second trimester ends for the First Year Class.
27	Saturday	End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.
29	Monday	Third trimester begins for the First Year Class.

MARCH

2	Wednesday	National Board Examination, Part III.
25	Friday	Spring recess begins at 5 p.m. for the First and Second Year Classes.

APRIL

1	Friday	Spring recess begins for Third and Fourth Year Classes.
4	Monday	Classes resume at 8 a.m. for First, Second, Third and Fourth Year Classes.
9	Saturday	End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m.
12, 13	Tuesday, Wednesday	National Board Examination, Part II.

MAY

7	Saturday	End of Year Clinical Clerkship Final Examination in Medicine, Moore Auditorium, 8 a.m.
13	Friday	Third trimester ends for the Second Year Class.
18	Wednesday	National Board Examination, Part III.

19	Thursday	Academic year ends at 5 p.m. for graduating students.
20	Friday	Commencement.
21	Saturday	End of Clinical Clerkship Final Examinations, Moore Auditorium, 8 a.m. Academic year ends for the Third Year Class.
27	Friday	Third trimester ends for the First Year Class.

JUNE

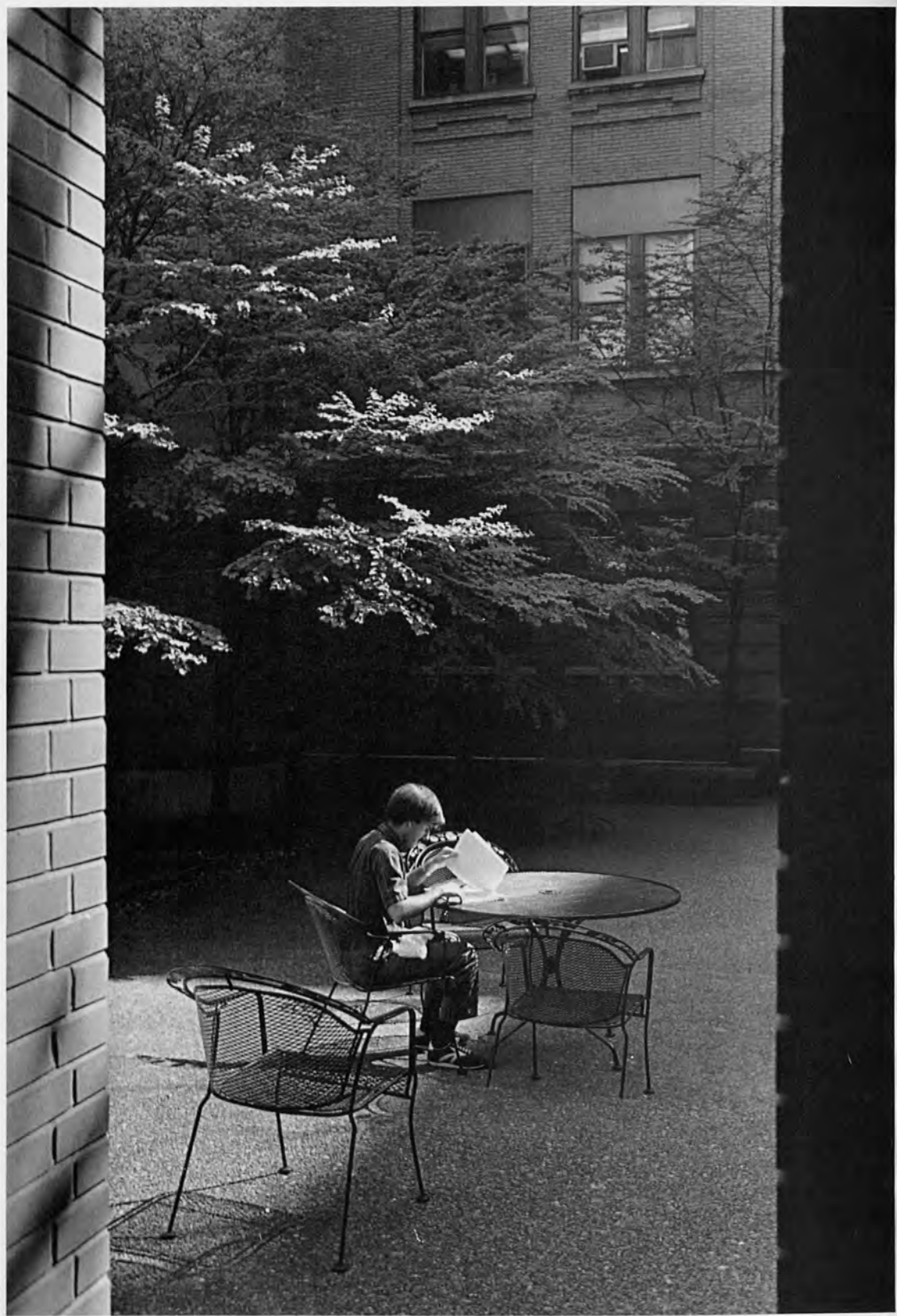
14,	Tuesday,	National Board Examination,
15	Wednesday	Part I.

CLERKSHIP AND SIX-WEEK ELECTIVE PERIODS

<i>Period</i>	<i>Begins</i>
I	June 8, 1987
II	July 20, 1987
III	August 31, 1987
IV	October 12, 1987
V	November 23, 1987
VI	January 18, 1988
VII	February 29, 1988
VIII	April 11, 1988

FOUR-WEEK ELECTIVE PERIODS

<i>Period</i>	<i>Begins</i>
A	June 8, 1987
B	July 6, 1987
C	August 3, 1987
D	August 31, 1987
E	September 28, 1987
F	October 26, 1987
G	November 23, 1987
H	January 4, 1988
I	February 1, 1988
J	February 29, 1988
K	March 28, 1988
L	April 25, 1988



THE STUDY OF MEDICINE AT WASHINGTON UNIVERSITY

The Washington University School of Medicine has one of the richest traditions of any medical school in the country. In the early 1900s it provided the leadership in shaping the system of clinical instruction provided by American medical schools, and today it remains one of the foremost institutions of medical education and research in the world.

The School of Medicine was formed in 1899 by the union of the first two medical schools established west of the Mississippi River: the Missouri Medical College and the St. Louis Medical College. When the two were united as the Medical Department of Washington University, they combined their strengths, offering the finest medical instruction in the Midwest.

In 1910, the School formed a relationship with Barnes Hospital, which was in the planning stages, and the existing St. Louis Children's Hospital (now called Children's Hospital) to allow students into the wards as clinical clerks. It also gave the School the opportunity to conduct clinical research and to appoint staff members of both hospitals. Until that time, no American medical school except Johns Hopkins conducted its clinical work in this fashion.

Washington University's program was immediately successful and emulated by other medical schools throughout the country, thus ushering in the modern era of American clinical education. William Welch, the first dean of The Johns Hopkins School of Medicine, declared that Washington University's new program "marks the second epoch in medical education in the United States, as Hopkins marked the first."

The reorganization of the clinical teaching was accompanied by a restructuring of the rest of the School's program in 1910. With the help of funds provided by the General Education Board and by St. Louis philanthropists and civic leaders Robert Brookings, William Bixby, Adolphus Busch, and Edward Mallinckrodt, the School built a new campus and appointed a faculty of internationally distinguished medical scientists. Among the features adopted by the reorganized School were: full-time teaching appointments, enlarged hospital and out-patient facilities, laboratory space for both preclinical and clinical departments, faculty time for research, and a teaching program which allowed undergraduate, graduate, and postgraduate students to have meaningful contact with eminent faculty members in informal small group settings. These tenets have resulted in bringing together a faculty, staff, and alumni who have been awarded many honors, appointments, and elections to important professional offices. Fifteen Nobel laureates have been associated with the School of Medicine, and 15 have been elected to the National Academy of Sciences. Many more are members of advisory boards of foundations and governmental granting agencies.

Today, the Washington University School of Medicine continues as one of the premier medical schools in the world. It excels at both the scientific and research bases of medicine and the application of that knowledge to patient care and clinical practice.

Information on the history of the Washington University School of Medicine written by Kenneth M. Ludmerer, M.D. Dr. Ludmerer is the author of *Learning to Heal: The Development of American Medical Education* (New York: Basic Books, 1985).

HISTORICAL PERSPECTIVE

Washington University School of Medicine's tradition of excellence includes its research in the basic and clinical sciences. Some examples: Evarts A. Graham, M.D., former head of the School's Department of Surgery, pioneered the use of chest surgery for patients suffering from chronic tuberculosis, and was the first surgeon to remove an entire affected lung to treat cancer (the patient subsequently lived 30 years). During the latter half of the 1920s, Dr. Graham developed a method of visualizing the gallbladder by x-ray, which opened the door for successful gallbladder surgery.

The first electron microscope used in the United States for biological research was constructed at the School of Medicine in 1935. During the same decade, researchers at the School's Mallinckrodt Institute of Radiology developed laminography, a method for imaging in slices that became the forerunner of computed tomography (CT scans), and was one of the first to receive a CT body scanner. Other "firsts" at Mallinckrodt: the use of hyperthermia in the treatment of cancer, and the development of PET (positron emission tomography), an imaging process that uses markers to picture the metabolism of the heart, brain, and other organs.

Under the care of Washington University physicians, patients at Barnes Hospital were among the first to receive insulin for diabetes. Today, Washington University Medical Center has the largest and most comprehensive program in the world for diabetes basic research, public and patient education, clinical training, and research and patient care. In October last year, the School of Medicine was awarded an eight-year grant totaling more than \$2.5 million to determine whether highly intensive forms of diabetes treatment can prevent or stop the progression of early eye, kidney, and nerve damage that occurs commonly in patients with insulin-dependent diabetes. The School of Medicine also leads in cancer research and in the study of heart disease. It is in the forefront of treatment and research to prevent the loss of vision and to restore sight.

In 1985-86, 23 Program Project and Center Grants were awarded by the National Institutes of Health, totaling nearly \$22 million:

- Healthy Aging and Senile Dementia
- Alzheimer's Disease Research Center
- A Resource of Biomedical Mass Spectrometry
- Program Project in the Pathophysiology of Human Growth
- Regeneration and Functional Recovery in Neural Tissue
- Diabetes Research and Training Center
- Basic Mechanisms of Seizure
- Senator Jacob Javits Center of Excellence in Neuroscience



- Neurobiology, Genetic, Epidemiology and Alcoholism
- Physiological Adaptations to Exercise in the Elderly
- General Clinical Research Center
- Pathophysiology of Renal Disease and Uremia
- Specialized Center of Research in Thrombosis
- Computer-Aided Drug Design
- Program in Medical Mycology
- Washington University Center for Vision Research
- Interdisciplinary Research Center in Immunologic Diseases
- Interdisciplinary Stroke Program
- Epidemiological Genetics and Family Study
- Lipid Research Center
- Study of Ischemic Heart Disease
- Cyclotron Produced Isotopes in Biology Medicine
- Studies of Neuronal Structure as Related to Function

FACULTY

The Washington University School of Medicine has one of the finest faculties of any medical school in the nation. In 1986, two more faculty members (bringing the total to 15) were elected to the National Academy of Sciences for their distinguished achievements in original research. One was honored for his research on blood cells' response to hormonal signals and another for his research on growth disorders and diabetes. Fifteen Nobel laureates have been associated with the School of Medicine. In 1986, 23 members of the faculty held individual or career development awards from the National Institutes of Health; 11 from the

American Heart Association, and one from the American Cancer Society. The School of Medicine has five faculty members with Method to Extend Research in Time (MERIT) status, a special recognition given to only a few NIH grantees, which provides long-term, uninterrupted financial support to investigators who have demonstrated superior achievement during previous research projects.

In 1986-87, the School employed 786 full-time, salaried faculty members in its 17 preclinical and clinical departments. The clinical departments are further strengthened by 975 part-time faculty members, a group of physicians who practice their medical specialties in St. Louis and are members of one or more of the staffs of the four hospitals in the Washington University Medical Center.

STUDENTS

The School of Medicine attracts a student body of exceptional quality. The 1986 Entering Class of 120 students was selected from a pool of 4,337 applicants. More than 95 percent of the applicants accepted to the School had one or more acceptances at other U.S. medical schools. The School is a national institution with 43 states, the District of Columbia, and seven foreign countries represented in the current enrollment. In 1987, the School conferred the M.D. degree upon 103 individuals and an additional nine received the M.D and Ph.D. degrees. Nearly half the class stayed in the Medical Center for residency training or for research.

The student body of the School of Medicine numbers approximately 540 medical students. Programs are also conducted for approximately 260 students who are pursuing degrees in health administration, occupational therapy, nurse anesthesia, physical therapy, and radiologic technology. The Division of Biology and Biomedical Sciences has extensive graduate training programs for over 300 students seeking the Doctor of Philosophy degree in areas of cell and integrative biology, molecular biology and biochemistry, the neural sciences, plant biology, and population biology.

PHILOSOPHY

The efforts of the School of Medicine are directed toward providing able students with a stimulating and challenging milieu in which they may acquire a thorough background in scientific medicine, as well as a deep understanding of the meaning of comprehensive medical care. In a field that is developing as rapidly as is medicine, education begun in medical school must serve as the foundation for a lifelong course of learning. As Sir William Osler pointed out some decades ago, a faculty, no matter how talented, can "only instill principles, put the student in the right path, give him methods, teach him how to study, and early to discern between essentials and nonessentials."

Students today are preparing to cope with a changing world and to contribute, in a constructive, considered way, to resolving the problems of medicine and of health care. To assist in that preparation, the faculty's mission is to preserve the joy of learning and to foster a spirit of discrimination and creativity. It is hoped that every student will achieve this grounding during their years in the School of Medicine.

In summary, the Washington University School of Medicine and the institutions in the Washington University Medical Center are committed to providing patients with high-quality medical care in a concerned, compassionate way, to increasing medical knowledge through research, and to educating superbly qualified young men and women in the health professions.

TEACHING FACILITIES

The Washington University Medical Center, spread over portions of six city blocks, is located along the eastern edge of Forest Park in St. Louis. Along the western edge of the park is the Hilltop Campus of the University. A regularly scheduled shuttle bus, operated for the benefit of students, faculty and staff, brings the two campuses within 10 minutes of each other.

The Medical Center was established in 1962. It now consists of the Washington University School of Medicine, Barnes Hospital, Jewish Hospital, Children's Hospital, Barnard Hospital, the Washington University School of Dental Medicine, and the Central Institute for the Deaf. Integral units of the Medical Center include the world-famous Mallinckrodt Institute of Radiology, the Institute for Biomedical Computing, and the Irene Walter Johnson Institute of Rehabilitation.

The last five years have been a period of unprecedented expansion for the School of Medicine. Expenditures for renovations and new construction projects exceeded \$98 million, while work space increased by 44 percent. This expansion includes the newly constructed, three-tower, 10-story Clinical Sciences Research Building (CSRB) and the East Building. With the new construction came a network of pedestrian bridges that interconnect Barnes, Jewish, and Children's hospitals with the CSRB and the rest of the School of Medicine. This ability to move freely among facilities enhances the interaction of all Medical Center institutions, greatly benefitting research and patient care.

The School is divided into two segments. The clinical departments are on the west side of the Medical Center, adjacent to hospital and patient areas, while the preclinical departments are to the east. Research and instructional activities occupy the greater portion of the facilities, with more than 1.6 million gross square feet. In the aggregate, the School now occupies nearly 2.5 million gross square feet of space.

The focal point of the preclinical teaching facilities is the McDonnell Medical Sciences Building, center of activity for entering medical students. The McDonnell Building, with 300,000 square feet of first class research laboratories and classroom space, was made possible by James Smith McDonnell III, a generous benefactor of Washington University. Rising nine floors above-ground, it contains administrative offices and two lecture halls on the first floor. Multidisciplinary teaching laboratories for first- and second-year students, and offices and research laboratories for the seven basic science departments and the Division of Biology and Biomedical Sciences are located on the upper floors. Modern centralized animal quarters are housed in the basement.

The North and South Buildings, in which centered the work of several Nobel laureates, have been extensively renovated. Along with the Cancer Research Building, they continue to provide space for laboratories, offices, the library, and some departmental facilities. The East Building houses an MRI (magnetic resonance imaging) facility containing a 20 kilogauss magnet, as well as a film library, computer installation and other components of the Mallinckrodt Institute of Radiology. Other facilities in the East Building include the Program in Physical Therapy, the medical and dental bookstore, and several administrative office suites.

The clinical departments of the School of Medicine, housed in nine buildings, are connected by a pedestrian bridge to the preclinical facilities. Washington University medical students receive intensive clinical training, and the School's clinical program is acknowledged as one of the best programs in the country. Over a five-year period (1981-1985), the Medical Center had more than three million days of care for patients in and outside the St. Louis area, and there were more than one million clinic and emergency room visits. In 1985, there were 1,868 operating beds among the Barnard, Barnes, Jewish, and Children's hospitals. In addition, students may take clinical training at the St. Louis Regional Medical Center and Cochran Veterans Administration Hospital; both are served by full-time and part-time faculty members of the School of Medicine.

Medical students work with patients in all areas of clinical care. This "hands-on" approach for clinical training, one-on-one with some of the top clinical faculty in the world, in a large, state-of-the-art medical center, makes the training at Washington University School of Medicine a vigorous and challenging experience.

The following facilities are owned and operated by Washington University.

William Greenleaf Eliot Division of Child Psychiatry, located in Children's Hospital, conducts an advanced teaching program in child psychiatry and is the focus for research and treatment in child psychiatry.

Irene Walter Johnson Institute of Rehabilitation is a center for training personnel in rehabilitation procedures, for treatment of disabled persons in the St. Louis metropolitan area, and for research related to chronic diseases.

Oscar Johnson Institute for Medical Research occupies the top five floors of the McMillan Hospital.

McMillan Hospital houses offices and research laboratories for the Departments of Neurology and Neurological Surgery, Ophthalmology, and Otolaryngology.

Edward Mallinckrodt Institute of Radiology—An internationally recognized center of excellence in teaching, research, and clinical services in Radiology, the Institute is housed in a 10-story building with satellite units in the West Pavilion of Barnes Hospital, the East Building, and the new Children's Hospital. MIR's facilities include two functioning cyclotrons and a 5 kilogauss Nuclear Magnetic Resonance unit.

Renard Hospital—With consolidation of Psychiatric patient-care services in the West Pavilion, this recently renovated eight-story structure provides additional office and laboratory space for the Department of Psychiatry.

St. Louis Maternity Hospital houses offices and research laboratories for the Departments of Obstetrics and Gynecology, Ophthalmology, and Otolaryngology. A new Perinatal Center and laboratories for research in the physiology of reproduction are located in this building.

West Building contains offices and research laboratories for the Department of Internal Medicine, as well as for the Department of Pathology.

David P. Wohl, Jr., Memorial Hospital (ten floors), opened in 1953, provides offices and laboratories for the Departments of Medicine and Surgery. Recently completed were facilities for a Cancer Center on floor three which is contiguous with companion facilities in the adjacent Barnard Hospital.

David P. Wohl, Jr., Memorial—Washington University Clinics are administered by Barnes Hospital and handle about 150,000 outpatient visits a year. Five floors of the building are devoted to the Clinics and five floors to research facilities for several departments of the School of Medicine. This building is owned by the School of Medicine, with Barnes Hospital operating the recently expanded Emergency Room and the David P. Wohl, Jr. Memorial—Washington University Outpatient Clinics.

Clinical Sciences Research Building

The Clinical Sciences Research Building, consisting of 382,080 gross square feet of space, is the newest structural addition to the Medical Center. The 10-story structure, constructed at a cost of \$55 million and dedicated in October 1984, houses research laboratories for the School's clinical departments, the Howard Hughes Institute, and contemporary animal care facilities.



Further, the Clinical Sciences Research Building is the connecting link for a series of enclosed pedestrian bridges that tie the Medical Center together. These enclosed, environmentally-controlled bridges connect Jewish Hospital on the north, the new Children's Hospital on the west, and the Wohl Buildings and Barnes Hospital to the south.

Institute for Biomedical Computing

The Institute for Biomedical Computing is an inter-school facility which spans computing research activities at both the School of Medicine and the School of Engineering and Applied Science. The Institute consists of two research-laboratory components, the Biomedical Computer Laboratory and the Computer Systems Laboratory, both of which have close ties with both Schools. The purpose of the Institute is to foster the development and application of advanced computing and engineering technologies to problems in biomedical science. In addition to its activities in collaborative research, the Institute serves as a focal point for interdisciplinary teaching and student research in areas not ordinarily included in conventional curricula.

The Institute has its primary location on the campus of the School of Medicine, but it also occupies the Edward L. Bowles Laboratory on the Engineering School campus. The Bowles Laboratory is adjacent to

Computer Science, Electrical Engineering, and other departments of the School of Engineering. This provides an Engineering School location for research and teaching activities associated with the Biomedical Computer Laboratory and the Computer Systems Laboratory. The arrangement creates opportunities for collaborations between the two campuses and fosters involvement of students in activities spanning the medical and computer-engineering disciplines.

Library

Founded in 1911, the Washington University School of Medicine Library is one of the oldest and largest medical libraries in the Midcontinental Region. It serves as an information center for the faculty, students, and staff of the Medical Center and, in addition, extends its services and resources to health professionals in the local, state, and national communities.

This year, construction will begin on a new library and biomedical communications center. The state-of-the-art building will integrate four components: a modern health sciences library, an audiovisual production and service complex, a computer teaching and information management laboratory, and a health information network that links regional, national, and international information resources.

The Library maintains a comprehensive collection of over 208,500 volumes and some 2,900 current subscriptions. An Audiovisual Center makes available to users some 1,500 audiovisual titles. Its History of Medicine Division includes such outstanding collections as the Bernard Becker Collection in Ophthalmology, the Goldstein Collection in Speech and Hearing, and the Paracelsus Collection of the St. Louis Metropolitan Medical Society. It houses the Archives of the Medical Center which includes records and private papers of the School, memorabilia, and oral histories of individuals who have made important contributions to American medicine. Among its manuscript collections are papers of William Beaumont, Joseph Erlanger, E. V. Cowdry, Evarts Graham, and Carl Cori.

The Library is a pioneer in technology application, and users will find most library functions computerized. Through its BACS database, students and staff may access from their offices a variety of information sources, among them, the Library's catalog of book and journal holdings, *Current Contents*, and MEDLINE. The world's output of knowledge is reached through online access to over 250 computerized data bases covering the biological, health, social and physical sciences. As a member of the large regional and national networks, the Library reaches other library collections nationwide through telecommunications.

The Medical Library is housed in three locations. The main School of Medicine Library, located at 4580 Scott Avenue, is on the second floor of the North Building of the Medical School. The Taylor Annex, located one block east of the main Library at 615 South Taylor Avenue, houses the rare books, the Archives of the Medical Center and older, non-rare books and journals. The Spruce Street Annex, which is in downtown St. Louis, houses rarely-used journals and books.

Library hours are 8 a.m. to 12 midnight on weekdays; 8:30 a.m. to 6 p.m. on Saturdays; and 1 p.m. to 10 p.m. on Sundays. Holiday hours are posted when applicable.

For information on the Library's special services, the "Library Guide," "Library Newsletter," or Director Susan Crawford, Ph.D. may be consulted.

The Medical Center

The School of Medicine is part of a medical center of nearly 1,900 beds (1,868 beds operational), and over 13,000 employees, providing over 567,300 days of care and more than 195,000 ambulatory care visits each year. Organized formally in 1962, the umbrella organization now known as the Washington University Medical Center consists of a confederation of seven strong, private institutions committed to the pursuit of excellence in health care, teaching, and research. Students receive clinical instruction and gain experience in all divisions of the Medical Center.



Over the years, with the growing confidence of working together, the Washington University Medical Center has undertaken increasingly complex projects. Evidence of this is the massive redevelopment project under way in the 36-block area surrounding the Medical Center. Working closely with the neighborhood, the Washington University Medical Center Redevelopment Corporation has, over a 12-year period, provided impetus for new office buildings, laboratories, apartment buildings, commercial areas, renovated single dwellings, and many public improvements. To date, nearly \$450 million worth of construction, renovation, and improvements have been completed or commissioned, with new construction by Medical Center institutions accounting for about 80 percent of this total. This program began its second 10-year phase in 1986.

Barnes Hospital is the largest hospital in the Medical Center. It is independently owned and, through special agreement, operates outpatient clinics in buildings owned by the University. The contiguous facilities provide a major source of clinical experience for medical students. Barnes Hospital is licensed for approximately 1,200 beds (operating about 1,083) and includes teaching facilities for all clinical departments except Pediatrics. All activities of the School of Medicine and Barnes Hospital are closely integrated, and

the hospital staff is composed exclusively of members of the faculty of Washington University School of Medicine.

The 18-story Queeny Tower has five nursing floors and two self-care floors, plus five floors of doctors' offices. The addition of four floors to the East Pavilion and a companion structure, the 18-story West Pavilion, has resulted in a facility that houses over 730 patient-care beds, over 50 operating rooms, a chronic renal dialysis unit, a 110-seat amphitheatre, doctors' offices, and additional facilities for the Mallinckrodt Institute of Radiology.

The combined East-West Pavilion, jointly owned by Barnes Hospital and the University, is one of the largest, most sophisticated tertiary medical facilities in the world. A large central diagnostic laboratory provides modern diagnostic patient services.

Barnard Free Skin and Cancer Hospital is independently owned but is operated by Barnes Hospital. It is a 44-bed hospital for the care and treatment of patients who suffer from skin diseases and cancer or who are undergoing special tests in the Clinical Research Center.

Children's Hospital, governed by its own Board since 1879, is an integral part of the Medical Center and is nationally recognized as a premier provider of advanced care for neonates, children, and adolescents. A completely new 235-bed, 500,000 square-foot facility was dedicated in April 1984. Children's offers the full range of primary, secondary, and tertiary pediatric care. The Hospital is recognized as a major referral and research center for a variety of diseases including neurological and communicative disorders, childhood diabetes, kidney and vascular diseases, craniofacial deformities and birth defects, and pediatric infectious diseases. The professional staff of Children's Hospital are members of the faculty of the School of Medicine.

Jewish Hospital, an acute and tertiary care facility licensed for 628 beds and operating 550, is a charter member and integral component of the Washington University Medical Center. It serves as a primary teaching hospital for the School of Medicine, providing education for medical students throughout their clinical experience, as well as training for graduate physicians in many specialties and subspecialties. The hospital provides an array of health-oriented services, an alcohol and chemical dependency program, including stress management, *in vitro* fertilization, a broadly based consultative service for the elderly (Program on Aging), an osteoporosis diagnosis and prevention center, and an inpatient and ambulant rehabilitation program.

Its modern nine-story Sydney M. Shoenberg Pavilion provides 300 inpatient rooms, four intensive care units, 16 operating suites, as well as diagnostic radiology and clinical laboratories. Jewish Hospital is also one of the largest research institutions in the State of Missouri, housing and sponsoring many major investigative programs in its Yalem Research Building and in the adjacent Washington University Clinical Sciences Research Building.

Central Institute for the Deaf, an internationally known institution, provides facilities for research into hearing problems, maintains a school for deaf and speech-handicapped children, provides outpatient clinics for children and adults, and engages in a program of professional education for scholars in the fields of audiology, otolaryngology, and education of the deaf.

The Washington University School of Dental Medicine is the newest member of the Medical Center family. The oldest continuously operating dental school west of the Mississippi and one of the oldest in the nation, the school began classes in 1866, and became Washington University's dental department in 1892.

Graduating approximately 60 new dentists each year, the school is known for both strong clinical and research programs, the latter primarily funded by the National Institutes of Health and the National Science Foundation. Many of the 130 faculty members have joint appointments with Washington University School of Medicine, and Barnes, Jewish, and Children's hospitals.

The School of Dental Medicine operates walk-in clinics, where third- and fourth-year students practice dental procedures. The school is aggressive in treating children's dental problems. Dental faculty operate several clinics, including one for maxillofacial prosthodontics, the rebuilding of jaws and other facial structures left abnormal by birth defects, or surgery to remove disease. Another clinic is in Children's Hospital, for both inpatients and outpatients. A residency training program in oral and maxillofacial surgery is conducted at Barnes Hospital.

In addition to the above facilities which make up the Washington University Medical Center, the following hospitals are affiliated with the School of Medicine, and various members of the staffs hold University appointments.

St. Louis Regional Medical Center—St. Louis City and St. Louis County, with 300 beds.

Malcolm Bliss Mental Health Center, with 150 beds.

Ellis Fischel State Cancer Hospital, Columbia, Missouri, with 113 beds.

St. Louis Veterans Administration Hospitals, with 1,028 authorized beds.

St. Louis Shriners Hospitals for Crippled Children, with 80 beds.

CURRICULUM

The curriculum is the product of prolonged and continuing study, by both faculty and students, of the present and probable future course of medical science and medical practice, and of the ways in which medical education can be kept abreast of this course. It is planned to provide students who enter medical school with diverse backgrounds and interests and who will undertake a wide variety of careers, with the basic knowledge and skills essential for their further professional development. Modern medical education can no longer hope to be comprehensive; it must be selective. Yet students must develop facility in the understanding and use of several related technical languages: those of anatomy, chemistry, physiology, and clinical medicine. They must share responsibility for the care of the patient. They must also learn how these areas of endeavor are interrelated, how the organization and needs of society influence the methods of providing medical care, and how new knowledge is acquired and old knowledge reevaluated.

The curriculum includes a core experience based upon a sequence of courses that will introduce students to the broad panorama of medicine. The principles, the methods of investigation, the problems, and the opportunities in each of the major disciplines of medical science and medical practice are presented in such a way as to help students select the career best suited to their abilities and goals.

The elective program helps students to decide where their major interests lie. It also enables them to benefit from the wide range of specialized knowledge and skills found in the faculty. As there is not enough time for all students to be introduced to each of today's areas of specialization, the elective program permits them to select, according to their own desires, the areas they wish to explore or to study in depth.

Table of Required Hours 1987-88

As reported to the Liaison Committee on Medical Education, representing the Council on Medical Education of the American Medical Association and the Executive Council of the Association of American Medical Colleges, credit hours for courses are expressed in terms of clock hours—the scheduled hours per year of actual lecture and laboratory contact between faculty and students. These clock hours are not to be interpreted as semester or quarter hours.

First-year courses are taught during the 36-week academic year.

Clock Hours	Courses
173	Gross Anatomy
51 (75)*	Biochemistry
70	Cell Biology
(6)	(Basic Genetics)**
17	Biomedical Statistics
18.5	Medicine in Modern Society
91	Microscopic Anatomy
47	Immunology
115	Physiology
35	Molecular Biology
28	Topics in Clinical Medicine
119	Neural Science
113	Microbiology and Infectious Diseases
33	Medical Genetics
0	Special Topic Sections
910.5	Total clock hours for the year
(940.5)	

Second-year courses are taught during the 36-week academic year.

Clock Hours	Courses
	Introduction to Clinical Medicine
124	Physical Diagnosis Core
7	Ophthalmology
7	Otolaryngology
10	Human Sexuality
41	Psychiatry
28	Radiology
13	Surgery
7	Rheumatology
17	Neurology and Neurosurgery
16	Developmental Biology (Peds)
7	Medical Sociology
5	Medical Ethics
245	Pathology
149	Pharmacology
	Pathophysiology
20	PP Cardiovascular
15	PP Pulmonary
19	PP Renal
27	PP Metabolism-Endocrinology
24	PP Gastro Intestinal
28	PP Hematology
12	PP Oncology
19	PP Neuropathophysiology
24	PP Developmental Biology (Ob/Gyn)
8	PP Nutrition
872	Total clock hours for the year

*Course content adjusted based on student's background in Biochemistry.

**A background course for students desiring additional preparation.

Clinical Clerkship (Third) Year is a 48-week academic year.

Clock Hours	Courses
462	Medicine Clerkship
154	Neurology/Neurosurgery Clerkship
231	Obstetrics/Gynecology Clerkship
38.5	Ophthalmology Clerkship
38.5	Otolaryngology Clerkship
231	Pediatrics Clerkship
231	Psychiatry Clerkship
462	Surgery Clerkship
1,848	Total clock hours for the year

Elective (Fourth) Year is a 48-week academic year.

To qualify for the Doctor of Medicine degree at Washington University School of Medicine, fourth-year students are required to participate in a minimum of 36 weeks of electives (full-time clinical or research courses). Two-thirds of the minimum required time for the Elective Year must be taken exclusively in residence in the Washington University School of Medicine elective course program. A complete listing of fourth-year elective offerings at Washington University School of Medicine is available through the Office of the Associate Dean for Curriculum. Students may participate in clinical electives of four and six weeks duration. If a student takes a research elective, that elective must be of at least 12 weeks duration.

A maximum of 12 weeks' credit is allowed for full-time elective course work taken at other academic institutions. These may be clinical or research electives. Students desiring credit for work to be done at other institutions must petition the Associate Dean for Curriculum and the standing subcommittee of the Committee on Academic Review and Promotions (CARP-III) for approval of the plan of study. Absolutely no credit will be granted for electives undertaken prior to subcommittee approval.

Credit may be given for elective work done at any point in the standard four-year Doctor of Medicine degree program so long as participation conforms to current elective guidelines and (a) the student is a duly registered, full-time student for a minimum of three years and nine months, including scheduled vacation time, and tuition is paid for four complete academic years; or (b) if transferring into the Second Year Class, the student is a duly registered, full-time student for a minimum of two years and nine months and tuition is paid for three complete academic years; or (c) if transferring into the Third Year Class, the student is a duly registered, full-time student for a minimum of 22 months and tuition is paid for two complete academic years.

Students are encouraged to take lecture-seminar elective courses, but such offerings are optional.

Total clock hours for the year 1,386

Total clock hours for four years 5,016.5

Remuneration for work done while participating in electives for credit is *prohibited*.

DEGREE PROGRAMS

The Washington University School of Medicine offers four programs leading to the M.D. degree: a regular four-year program, a five-year program, the M.A./M.D. program, and a combined M.D./Ph.D. program.

Doctor of Medicine, Four-Year Program

By conferring the M.D. degree, the University certifies that the student is competent to undertake a career as a doctor of medicine. It certifies further that, in addition to medical knowledge and skills, the graduate possesses qualities of personality—compassion, emotional stability, and a responsible attitude—essential to an effective professional life.

A course of medical education for the M.D. degree ordinarily consists of a minimum of four years of study. Students recommended for the degree Doctor of Medicine must be of good moral character; they must have completed an entire academic course of instruction as matriculated medical students; they must have passed all required subjects or the equivalent and have received satisfactory grades in the work of the full academic course, and they must have discharged all current indebtedness to the University. Individuals applying for licensure must be at least 21 years of age.

At the end of the final academic year, students who have fulfilled these requirements will be eligible for the M.D. degree.

Five-Year Program

In addition to the regular four-year program leading to the M.D. degree and the M.A./M.D. degree program, students are permitted to spend one additional year in an academic program in a medical or medically-related field. The program must be arranged with an academic advisor and is subject to the approval of the Committee on Medical Education.

M.A./M.D. Program

Medical students who are interested in obtaining a significant research experience during their M.D. training may apply for admission to the M.A./M.D. Program. This program allows selected students to spend one full year (12-15 months) in a research laboratory. Participating students will be expected to write a thesis at the end of their research time to qualify for receipt of a master's degree in biological science which will be conferred along with the M.D. degree upon graduation. Students accepted into this program qualify for a stipend during the research time. Additional information can be obtained by contacting the Medical Scientist Training Program office.



M.D./Ph.D. Medical Scientist Training Program (MSTP)

Washington University offers a combined M.D./Ph.D. program within the Division of Biology and Biomedical Sciences and the School of Medicine. The program is designed for selected students interested in a research career in medicine whose undergraduate education placed major emphasis on science. The program permits the student to complete both M.D. and Ph.D. degrees, usually within six years. The major purpose of the program is to provide basic research training to individuals who wish to join faculties of clinical or preclinical departments at medical schools throughout the country.

Financial support in the form of stipends (\$7,500 per year, after taxes) and tuition remission will be available to all students admitted to the program. Support is obtained from National Institutes of Health grants and is subject to their policies governing funding. There are more than 100 students currently enrolled in this program. Although most individuals enter the program as first-year students, applications will be accepted from students in their first or second year of the medical school.

Applicants must meet the requirements for admission to both the School of Medicine and the Graduate School of Arts and Sciences and have had the equivalent of one semester of research experience. In addition to the minimum requirements established for acceptance into both schools, students planning to concentrate in disciplines related to the chemical or physical sciences should have completed mathematics through calculus, physics and physical chemistry (with calculus as a prerequisite), and advanced organic chemistry. A course in differential equations is also recommended. For students whose major interests are

in the more biological aspects of medical science, the requirements for chemistry are less rigorous, but a strong background in mathematics and physics is essential.

The Medical Scientist Training Program is structured to consist of three medical school years, with the remaining period to be spent in research. Every effort is made to individualize each student's curriculum, based on previous background and interests. The time devoted to research is of at least three years duration. Students in the combined program will normally take the usual medical school courses in the first two years. At the end of that time they enter the graduate phase of the program, completing any necessary coursework and carrying out their thesis research. The last year of the student's program is always the 12-month clinical period. During this year students acquire the major clinical skills which are important to their pursuing an internship or residency program immediately following graduation. The M.D. and Ph.D. degrees are awarded jointly at the completion of the entire training period. Most students complete their training in six years.

Students usually begin their training on July 1 of the year they enter the School of Medicine. The first two weeks of the summer will be spent visiting faculty in various departments in order to select a laboratory for summer research. Students will also spend the summer between their first and second years doing research. The laboratories selected for summer research need not be those chosen for the Ph.D. portion of the program. The members of the Medical Scientist Training Program Committee are available to students to help them decide in which elective courses and laboratories they will participate.

Students in the combined degree program will take the usual medical school courses in the first two years supplemented by special tutorials and electives.

A student who passes a qualifying examination in any of the regularly offered preclinical courses will be allowed to substitute either advanced coursework or laboratory research in the time made available. In this way, students may have an opportunity to do supervised research immediately after entry. Research can be continued in free periods during the first two years.

The performance of each student will be reviewed annually. Students are expected to maintain a high scholastic standing as well as a commitment to research.

Years 3, 4, 5

Students will spend the third, fourth, and fifth years in satisfying the following requirements of the Graduate School of Arts and Sciences for the Ph.D. degree:

- 1) completion of coursework;
- 2) successful performance in qualifying examinations;
- 3) execution of original research suitable for a dissertation; and
- 4) defense of the thesis.

Students are also required to carry out a teaching assistantship for one semester.

Prior to beginning the third year, students will select a faculty advisor under whom the thesis work will be carried out and the training program or department in which the Ph.D. degree will be obtained. For purposes of graduate training, the Division of Biology and Biomedical Sciences is divided into the following programs: Cell and Integrative Biology, Molecular Biology and Biochemistry, Neural Sciences, Plant Biology, and Population Biology. These interdisciplinary programs draw together faculty from all of the preclinical departments of the School of Medicine and from the Department of Biology of the faculty of Arts and Sciences. They provide maximum flexibility for student training and, by providing for interdepartmental teaching, not only avoid duplication but assure that each course is taught by the most qualified faculty, regardless of departmental affiliation. Therefore, course requirements reflect the student's background and interests rather than a rigid course sequence. Students may also receive their training by special arrangement in other graduate science departments within the University.

A detailed listing of the various courses available in the Division of Biology and Biomedical Sciences begins on page 155 as well as in the sections describing the various departments of the School of Medicine.

Monthly seminars are held for students during the research years. Conducted by medical scientists of the clinical departments of the School of Medicine, these seminars are aimed at stimulating student interest in clinical medicine and at increasing awareness of major research problems in clinical medicine.

Final Year in Clinical Medicine

The sixth year is the clinical year of the normal medical curriculum. Transition to this year is facilitated by a special two-week course, Introduction to Clinical Medicine. The intensive clinical training provided in this year is the last formal requirement for the M.D.

degree. Both the Ph.D. and M.D. degrees will be granted simultaneously at the end of this clinical year.

Interested students must apply to the School of Medicine through the American Medical College Application Service. Upon receipt of the AMCAS application by the School, additional information regarding forms specific to the combined-degree program will be mailed to applicants.

For questions or information regarding the M.D./Ph.D. program, please contact:

*Medical Scientist Training Program
Campus Box 8033
660 South Euclid Avenue
Washington University
St. Louis, MO 63110
Telephone: 314/362-7190*

Doctor of Philosophy Programs

The Division of Biology and Biomedical Sciences offers predoctoral programs in Cell and Integrative Biology, Molecular Biology and Biochemistry, Neural Sciences, Plant Biology, and Population Biology. These educational activities are organized on an interdepartmental basis by the faculty of the seven preclinical departments of the School of Medicine, as well as the Department of Biology in the School of Arts and Sciences. All degrees are awarded through the Washington University Graduate School of Arts and Sciences. Additional information about the Divisional programs may be obtained by writing to:

*The Office of Graduate Affairs
Campus Box 8072
Washington University School of Medicine
660 South Euclid Avenue
St. Louis, Missouri 63110*

APPLYING FOR ADMISSION

Washington University encourages application from and gives full consideration to applicants for admission and financial aid without respect to sex, race, handicap, color, creed, or national or ethnic origin. University policies and programs are nondiscriminatory. The School of Medicine is committed to recruiting, enrolling, and educating an increased number of students from racial minority and educationally deprived groups.

Preparation for the Study of Medicine

Entrance requirements to the School of Medicine are:

1. evidence of superior intellectual ability and scholastic achievement;
2. completion of at least 90 semester hours of college courses in an approved college or university;
3. completion of the New Medical College Admission Test of the Association of American Medical Colleges;
4. evidence of character, attitude, interests, and motivation suitable for a career in medicine.

Chemistry, physics, and mathematics provide the tools for modern biology, for medicine, and for the biological basis of patient care. Thus, a firm grounding in these subjects is essential for the study of medical sciences. Entering students are expected to have had at least the equivalent of one-year courses at the undergraduate level in physics and biology; to have studied mathematics through integral calculus; and to have a background in chemistry, including organic chemistry. In selected instances, one or more of these prerequisites may be waived by the Committee on Admissions, but applicants are strongly advised to pursue their interests in these and in other areas of science.

A major goal of undergraduate college work should be development of the intellectual talents of the individual. This often involves the pursuit of some area of knowledge in depth, whether in the humanities, social sciences, or natural sciences. At the same time, a diversity of background is encouraged in order to provide a necessary foundation for cultural development. Specific courses, other than the few in the natural sciences, are not presented as prerequisites because a great variety of courses may prepare students for the many roles they may play in their medical careers.

Application Procedure

The Washington University School of Medicine participates in the American Medical College Application Service (AMCAS) of the Association of American Medical Colleges. AMCAS is a centralized procedure for applying to any participating medical school with only one application and one set of official transcripts of academic work.

The AMCAS Application for Admission, common to all participating medical schools, is distributed by the AMCAS and preprofessional advisors. Applicants are urged to file their applications as early as possible.

Applicants to the 1988 First Year Class have until November 1, 1987 for AMCAS to receive their applications. On receipt of the application from AMCAS, the Office of Admissions promptly forwards to applicants the additional materials that must be submitted to complete the application process. At this stage, a non-refundable Application Service Fee of \$45 is charged by the University. Once complete, the applicant's admission credentials are reviewed and independently evaluated by members of the Committee on Admissions. The Committee would like to interview every applicant who passes the initial evaluation screening process, but since this involves several thousand applicants, it is physically impossible to accomplish. Therefore, selected applicants are invited for a personal interview, as well as a tour of the School of Medicine and the Washington University Medical Center. This visit will provide an opportunity for the applicant to meet and talk with students and faculty members.

If an applicant is planning an interview trip which will include the St. Louis area, it is appropriate to write the Interview-Appointments Secretary, Committee on Admission, Box 8107, Washington University School of Medicine, 660 South Euclid Avenue, St. Louis, Missouri 63110, to inquire if an interview has been authorized. The inquiry should be made at least three weeks in advance of the anticipated travel. The Office of Admissions is open weekdays from 8:30 a.m. to 5 p.m. central time.

Admission decisions are made by the 20-member faculty Committee on Admissions. Washington University School of Medicine operates on a rolling admissions schedule beginning October 15, and applicants are notified as soon as a final admission decision has been made on their application. By May 15, 1988, every applicant should have a final decision: accepted, waiting list, or not accepted.

Upon notification of acceptance for admission to the School, the applicant is required to file a Statement of Intent. Three options are presented: 1) accept the offer of admission and submit the \$100 reservation deposit; 2) accept the offer of admission, submit the \$100 deposit, and request financial aid materials; and 3) decline the offer of admission. The \$100 acceptance deposit reserves a place in the class and is applied to the tuition charge at the time of matriculation. If an accepted applicant withdraws from the class with written notification to the Admissions Office prior to June 16, 1988, the deposit is refunded.

Washington University School of Medicine Distinguished Student Scholarships

The School has established five full-tuition scholarships to be awarded annually to members of the entering First Year Class. The scholarships will be awarded, without regard to financial need, to students of proven academic excellence. In early fall 1987 selected applicants to the School's 1988 First Year Class will be invited to file applications for scholarship consideration. Selection will be made by a committee of the faculty and will be based on demonstrated superior intellectual achievement as well as an assessment of the applicant's character, attitude, motivation, and maturity. The announcement of the 1988 scholarship recipients will be made on March 8, 1988.

The scholarships are subject to annual renewal. Recipients of these scholarships will be expected to maintain academic excellence. If a scholarship is not renewed, the student may file for financial aid from the School.

A scholarship recipient may not concurrently participate in the School's Medical Scientist Training Program, the National Health Service Corps Scholarship Program, or the Armed Forces Health Professions Scholarship Program. Scholars may apply to the School for financial aid in addition to the full-tuition scholarship. Additional aid would be determined on the basis of documented financial need.

Third Year Class Transfer Program

Each year the Washington University School of Medicine accepts 8 to 15 transfer students into its Third Year Class. This class enlargement is permitted because of the abundant clinical training facilities available in the Medical Center and because of the existence of a national need for such transfer positions. Transfer applications are accepted from well-qualified students enrolled in U.S. medical schools, who have a cogent reason for requesting transfer and who have the full approval of the dean of their current school.

Transfer application forms for our 1988 Third Year Class are available on August 1, 1987. Application deadline is November 1, 1987. Those applicants selected for interview will be invited to visit the Medical Center during November 1987. All applicants will be notified of the decision of the Committee on Admissions by December 31, 1987. Inquiries should be directed to:

*Third Year Class Transfer Program
Washington University School of Medicine
660 South Euclid Avenue—Campus Box 8077
St. Louis, Missouri 63110*

FINANCIAL INFORMATION

Cost of Education

For a first-year matriculant, tuition and housing rates for the 1987-88 academic year are listed below. Although the University reserves the right to change the fees at any time without notice, any change will not become effective until the 1988-89 academic year. Other items listed provide an estimate of the expenses for a single student in the 36-week, First Year Class. The total of these figures suggests a basic minimum budget of approximately \$19,782. Allowances for entertainment, travel, clothing, and other miscellaneous items must be added to this estimate.

Tuition (includes Student Health Service and Microscope Lending Plan)	\$14,100
Books, supplies, and instruments	\$ 1,146
Housing (single room, Olin Residence Hall)	\$ 1,890
Board (Medical Center cafeterias)	\$ 2,646

Student Health Service

The Student Health Service provides comprehensive health care, including hospitalization, for all students in the School of Medicine. Health insurance coverage for dependents of students can be arranged.

Microscope Lending Plan

Microscopes which meet the technical requirements set by the faculty are provided at no additional charge to each student in the First and Second Year Classes. The Plan saves students the high cost of microscope purchase and makes available to them a superior quality instrument.

Registration, Payment of Financial Obligations, and Refunds

All tuition and fee payments are due and payable on the dates specified in the published calendars of the programs in the School of Medicine. Failure of a student to register on or before the date specified in the published calendar will result in a late registration fee of \$50, to be added to the amount due. Any tuition and fee payments due from the student and not paid at the time of registration or on the specified due date accrue interest at the lesser of: (a) the rate of one percent above the prime interest rate in effect on the first business day of the month in which that payment is due, or (b) the maximum lawful interest rate then in effect. Any amounts not paid when due plus accrued interest thereon must be paid in full within three months of the original due date. If a student fails to settle such unpaid amounts within three months of the original due date, the School of Medicine will not release the student's academic record or progress reports pending settlement of the unpaid account. A student who has not satisfied all past due financial obligations to the University one month before the end of the academic year will not be allowed to progress to the next academic year or graduate.

A student who withdraws from the School will receive a pro rata refund of tuition and appropriate fees. The refund will be based on the ratio of the class days enrolled (from the first day of classes to the termination date) to the total number of class days in the term for which tuition and fees were paid. It is understood that the date on which a student formally notifies the Registrar's Office in writing of the decision to withdraw from the School of Medicine, shall be regarded as the termination date, with no retroactive clause to be accepted. A prospective date will be accepted, however. If tuition and fees were paid entirely or in part by financial aid from the School, the refund will be applied first to the total repayment of the accounts from which financial aid was drawn, with any remaining refund balance given to the student. Financial aid received in excess of the costs of tuition and fees must be refunded by the student to the School on the same pro rata basis as calculated for the tuition refund outlined above.

Financial Assistance

The ability to finance a medical education at Washington University does not influence the student selection process. As all students accepted for admission have proven scholastic ability, financial assistance is awarded solely on the basis of documented financial need which cannot be met by student and family resources. Students who consider themselves financially independent of their parents must arrange for loans to replace the amount of support parents are analyzed to have the potential to contribute. The School of Medicine's Office of Financial Aid (Box 8059) will assist students in making these arrangements.

At the time accepted students indicate they will matriculate in the School of Medicine, they may request an application for financial aid. The Graduate and Professional School Financial Aid Service (GAPSEAS) Financial Statement and other financial aid material, information, and instructions will be sent to the students by return mail. The GAPSEAS Financial Statement for the 1987-88 academic year solicits information about the applicant and parents, including a detailed description of resources and liabilities. In addition, it requests information about the income, expenses, education, and employment history of the student's spouse (or spouse-to-be). The School asks that the statement be forwarded promptly, within two weeks from date of receipt, to GAPSEAS for processing.

Financial aid award decisions are made by the five-member Committee on Student Financial Aid, and applicants are notified of the award decision within two weeks of the date the processed Financial Statement is received from GAPSEAS. Official copies of the parents' and the applicant's U.S. individual income tax returns complete the data required for financial aid consideration. All information is held in strict confidence.

Financial aid awards are credited toward payment of tuition and fees. Proceeds from loans may be disbursed directly to the borrower. The loan portion of an award will be funded through the resources of the School of Medicine or through the Guaranteed Student Loan (GSL) program. All loans awarded by the Committee are free of interest while a student is enrolled in the School.

Financial aid awards are made for a given academic year. Students may reapply for financial assistance in succeeding years if they remain in good academic and personal standing, and if there is continued financial need. Awards made to a student may vary from year to year, depending upon the student's needs and upon the availability of funds to the Committee. Students are responsible for filing applications for renewal of awards in the spring of each year.

The Committee holds that students receiving assistance have an obligation to notify the Committee in writing if their financial situation changes, for example, through employment or receipt of a scholarship not anticipated at the time the application was submitted.

First- and second-year students are urged not to accept employment during the academic year. A number of fourth-year students find employment in hospitals within the Medical Center. The Personnel Office provides assistance to students' spouses seeking employment.

Policy For International Students

The admission decision at Washington University School of Medicine is based on academic and personal merit and not on the ability of the student to pay the costs of education. However, individuals who are not citizens of the United States of America or who do not hold U.S. Permanent Resident Visa status are not eligible for financial aid due, in part, to regulations covering most programs used by the School to fund fi-

nancial assistance. Therefore, in order for the School to complete the required documents which are necessary for issuance of a Visa, the student must document, by a date and in a manner designated by the School, that the necessary amount of funds, as established by the School, is available to pay the costs of education (tuition and living expenses) for the anticipated period of enrollment, normally four years.

Documentation of the required amount of financial resources may be by a letter of credit or by deposit of funds in an escrow account with a bank designated by the School. In either manner, the funds must be available only to the School. Should the amount prove inadequate to cover the necessary costs, an additional letter of credit or deposit to the escrow account will be required. Unused funds will be released upon the student's termination, withdrawal, or graduation from the School.

Standards for Satisfactory Academic Progress for Financial Aid Eligibility

Federal law and regulations require that all students receiving financial assistance from Federal Title IV funds maintain satisfactory academic progress. The following policy presents the standards adopted by the Washington University School of Medicine. The policy applies to all students receiving financial aid.

Academic requirements for the M.D. degree include the satisfactory completion of the curriculum designated by the faculty. The progress of each student working toward an M.D. degree is monitored carefully and at least once each academic year by the designated Committee on Academic Review and Promotions. The qualitative measure of performance is based on a Pass/Fail grading system for the first trimester of the first year, and thereafter on an Honors/High Pass/Pass/Fail/Incomplete and Deferred grading system. A student who does not satisfactorily complete all course requirements may be permitted to remediate. In this case, a student assigned to an individualized program which deviates from the norm and who earns satisfactory qualitative assessment in all courses for which enrolled will be deemed to be making satisfactory academic progress. The individualized program permits a student to take one final makeup re-examination in a course which a student has failed.

The normal time frame for completion of required course work for the M.D. degree is four academic years. Due to academic difficulties or personal reasons a student may require additional time. In such situations, the Committee on Academic Review and Promotions may establish a schedule for that student which departs from the norm. To be considered to be making satisfactory academic progress, the student must complete the first two years of the curriculum by the end of the third year after initial enrollment. The Committees on Academic Review and Promotions will monitor the progress of each student at the conclusion of each academic year to determine that the student is making sufficient progress to meet the time limits as specified. A student not making sufficient progress will be deemed not to be making satisfactory academic progress.



A student may be granted a leave of absence for health reasons or personal reasons. The period of time for which the student has been granted a leave of absence shall be excluded from the maximum time frame expected for completion of the program.

Medical students who are accepted for transfer from other medical schools will be evaluated with respect to levels of academic progress attained and a determination will be made as to remaining years of financial aid eligibility. This determination will be coordinated among the Assistant Dean in Academic Administration, Associate Dean for Student Affairs, and the Director of Student Financial Aid.

A student failing to meet one or more of the standards of progress shall be placed on financial aid probation. While on probation the student may receive financial assistance for one trimester, semester or equivalent time period. At the conclusion of this period, the student must have achieved compliance with each standard.

A student who does not achieve compliance with each standard by the conclusion of the probationary period is suspended from financial aid eligibility.

The Office of Student Financial Aid must notify a student of implementation of probationary status and/or suspension.

A student shall be reinstated for financial aid eligibility at such time as that student has completed satisfactorily sufficient course work to meet the standards of progress.

A student on financial aid probation or suspension may appeal that status by indicating in writing to the Director of Student Financial Aid the existence of mitigating circumstances which should result in reinstatement of financial aid eligibility. Each appeal will be considered on its merit by the Committee on Student Financial Aid.

The Director of Student Financial Aid shall have primary responsibility for enforcement of this policy. The Director shall provide in writing to each student at the time of initial enrollment a copy of this policy. The Director shall ascertain at the time of each disbursement of funds and prior to certification of a financial aid application that the student is in compliance with the policy.

Scholarship Funds

Albert G. Blanke, Jr. Endowed Scholarship Fund. Established by a generous gift in 1982, the fund provides scholarship assistance for deserving students in the School of Medicine.

Gilbert L. Chamberlain, M.D., Scholarship Fund. Created in 1971 by Dr. Gilbert L. Chamberlain to be used to aid worthy students in acquiring their medical education.

Cecil M. Charles—Nu Sigma Nu Medical Student Scholarship Fund. Established by the Nu Sigma Nu Medical Fraternity in memory of Dr. Charles.

Grace Strong Coburn Scholarship Fund. Created in 1962 through the bequest of Mrs. Grace Strong Coburn for scholarships in the School of Medicine.

T. Griswold Comstock Scholarships. Established under the will of Marilla E. Comstock for students who would otherwise be unable to obtain a medical education.

Dr. Charles Drabkin Scholarship Fund. Created in 1964 to provide financial assistance to medical students.

Robert Elman Scholarship in Surgery. Created in 1980 through the bequest of Minna Elman in memory of her husband.

Carl Fisch Scholarship Fund. Created in memory of Dr. Fisch by his daughter, Marguerite F. Blackmer. Provides support to students who demonstrate financial need.

George F. Gill Scholarship Fund. Instituted in memory of a former clinical professor of pediatrics.

Harvielle-Bailey Scholarship. Established in 1970 under the will of Miss Isabel Bailey Harvielle as a memorial to Dr. Charles Poplin Harvielle and Dr. Steele Bailey, Jr., alumni of the School.

Dr. Grace Huse Memorial Fund. Provides scholarship awards for deserving Washington University medical students.

Insurance Medical Scientist Scholarship Fund. Established for the training of promising scholars intent upon a career in research and academic medicine.

Jackson Johnson Scholarship Fund. Provided through a bequest in 1930 from Jackson Johnson.

Dr. Lorraine A. Johnsrud Scholarship Fund. Established in 1983 as a memorial to Lorraine from her classmates, friends, and family to assist deserving medical students in the funding of their medical expenses.

Henry J. Kaiser Family Foundation—Medical Century Club Scholarship Fund. Following the Foundation's generous gift in 1980 for medical student scholarships, the Medical Century Club accepted the challenge to raise new scholarship funds to match an additional gift from the Foundation.

George D. Kettelkamp Scholarship Fund. Established in 1969 by Mrs. Kettelkamp in memory of her husband, an alumnus of the School of Medicine.

Albert F. Koetter, M.D., Scholarship Fund. Established in 1978 by Mrs. Stella Koetter Darrow in memory of her father, an alumnus and former faculty member of the School of Medicine. At least one full-tuition scholarship is awarded annually on the basis of academic achievement and financial need.

Anne L. Lehmann Scholarship Fund. Established in 1983 to grant continued scholarship support to medical students.

Maude L. Lindsey Memorial Scholarships. Created in 1976 to assist students in the School of Medicine.

John R. Lionberger, Jr., Medical Scholarship Endowment Fund. Created in 1982 by Dr. John R. Lionberger to be used to aid worthy students in acquiring their medical education.

Eliza McMillan Scholarship Fund. Provides assistance to young women in any of several schools of the University to secure an education.

Medical Center Alumni Scholarship Fund. Awarded on the basis of academic achievement and financial need.

Roy B. and Viola Miller Memorial Fund. Created in 1963 through the bequest of Roy B. Miller to provide scholarships for medical students and for postgraduate students engaged in study and research in the medical sciences.

The Warren S. and Dorothy J. Miller Scholarship Fund. Established in 1982 through the bequest of Dorothy J. Miller to provide scholarships for any students engaged in studies leading to the degree of Doctor of Medicine and especially for those students with an aptitude and desire for the general practice in internal medicine.

Minority Medical Students Scholarship Fund. Instituted by minority graduates of the School of Medicine and supported by them, other alumni, faculty and friends, this fund provides two \$5,000 scholarships to first-year minority medical students. One scholarship will be based on academic accomplishment from the premedical school record. The second scholarship will be based on financial need. Selection of recipients will be made by the Minority Medical Students Scholarship Fund Committee.

Mr. and Mrs. Spencer T. Olin Fellowships for Women. Provides for annual financial support to women in any of several disciplines. Application deadline is February 1.

William B. Parker Scholarship Fund. Established in 1976 by the School of Medicine in honor of William B. Parker's fifty-one years of service to the School.

The George M. (M.D. '32) and George K. (M.D. '64) Powell Medical Student Scholarship Fund. Established in 1984 by Mrs. George M. Powell in grateful appreciation for the medical education provided to her husband and son by the Washington University School of Medicine, which so positively affected the lives of the Powell Families.

Henry and Louise Reller Scholarship. To be given to medical students in the name of the parents of Louise Reller.

Samuel Jennings Roberts Scholarship Fund. Created to provide scholarships for any students engaged in study leading to the degree of Doctor of Medicine.

Robert Allen Roblee Scholarship Fund. Established in 1948 through the gift of Mrs. Joseph H. Roblee for students in the School of Medicine.

Thomas W. and Elizabeth J. Rucker Scholarship Fund. Created in 1956 under the will of Eugenia I. Rucker, in memory of her mother and father.

Joseph H. Scharf Scholarship Fund. Provided in 1949 through the bequest of Dr. Joseph H. Scharf.

School of Medicine Scholarship Fund. Created in 1970 to provide financial assistance for medical students.

Dr. John B. Shapleigh Scholarship Fund. Established in 1926 with the bequest of Dr. John B. Shapleigh and supplemented by contributions from Mrs. Shapleigh and Miss Margaret Shapleigh.

Alexander Balridge Shaw Scholarship Fund. Created in 1958 through the bequest of Roy A. Shaw in memory of his father, Dr. Alexander Balridge Shaw.

Ernie Simms Scholarship Fund. Founded in 1984 by friends, colleagues, and former students of Professor Simms in recognition of his contributions to scholarly research and teaching in the Department of Microbiology and Immunology.

Beulah B. Strickling Scholarship Fund. Established in 1960 with a bequest from Mrs. Beulah B. Strickling.

Marleah Hammond Strominger Scholarship. Established in 1971 by the family and friends of Marleah Hammond Strominger. The recipient shall be a motivated student with need for financial assistance and shall come from a disadvantaged background.

Edwin H. and Virginia M. Terrill Scholarship Fund. Established in 1964 with the bequest of Dr. Edwin H. Terrill, an alumnus. It was Dr. Terrill's hope that scholarship recipients would repay into the Fund the amount of the award.

Mildred Trotter Scholarship Fund. For students with documented financial need, the fund was established in 1979 by Dr. and Mrs. Paul Guttman, and supplemented by former students of Dr. Trotter, as a tribute to her many years of teaching in the Department of Anatomy.

Hiromu Tsuchiya Scholarship Fund. Created to provide scholarships in the School of Medicine.

Tubolske-Jonas-Tubolske Medical Scholarship Fund. Established in 1974 by Rose T. Jonas in memory of her father, husband, and brother. The recipient shall be a senior student preparing to enter the field of surgery, obstetrics and gynecology, or internal medicine.

Louis H. Waltke and Marie Waltke Memorial Fund for Medical Education. Created in 1984 to provide scholarships and fellowships at the School of Medicine.

Scholarship and Loan Funds

Isabel Valle Brookings Scholarship and Loan Fund. Established in 1957 by Isabel Valle Brookings (Mrs. Robert S.) for scholarships and loans in the School of Medicine.

Arpad Csapo, M.D., Memorial Scholarship and Loan Fund. Established in 1982 by Elise Csapo in memory of her husband, and by his friends and colleagues to provide assistance for students who have shown promise in fields relating to reproductive medicine.

Danforth Foundation Loan and Scholarship Fund. Provides financial assistance for medical students.

Danforth Medical Foundation Fund. Created through gifts from the Danforth Foundation and the late William H. Danforth to furnish loans, scholarships, or outright grants to talented and promising young men and women engaged in study or research in basic medical or clinical sciences.

Paul H. and Lila L. Guttman Student Aid Fund. Established in 1976 to provide financial assistance to qualified medical students.

Robert Wood Johnson Foundation Fund. Created in 1972 to provide financial assistance for students who are from rural backgrounds, members of specified minority groups, and women.

Phi Beta Pi—Charles Ruggieri Scholarship/Loan Fund. Established in 1985 by the Washington University Alumni of the Phi Beta Pi medical fraternity to honor Charles Ruggieri and to assist deserving medical students enrolled in the Washington University School of Medicine with the funding of their undergraduate medical education.

William H. and Ella M. Schewe Fund. Established to provide financial assistance to worthy students in the medical school.

School of Medicine Loan and Scholarship Fund. Created in 1970 to provide financial assistance for medical students.

Wilkinson Scholarship Fund. Created in 1968 by the bequest of Anna J. Wilkinson in honor of her husband, Dr. George E. Wilkinson. Medical and postdoctoral students are eligible for Wilkinson scholarships or loans.

Loan Funds

American Medical Association Loan Program. Makes available bank loans without collateral to eligible medical students, interns, or residents who are citizens of the United States. Applications for such loans are made through the Education and Research Foundation of the American Medical Association.

Ruth Elizabeth Calkins Scholarship Loan Fund. Established by Dr. Delevan Calkins in honor of his granddaughter.

Health Professions Student Loan Fund. Established by federal legislation for medical students with a demonstrated financial need. Loans are available for long terms at favorable rates.

Ursula Hecker Loan Fund. Established in 1967 by a bequest from Ursula Lee Hecker for the use and benefit of worthy, deserving, and needy medical students.

Robert Wood Johnson Foundation Student Loan Guarantee Program. Provides "a last-resort source of funds for educational expenses."

W. K. Kellogg Foundation Loan Fund. Provides financial assistance to medical students in need of such aid.

Gustel and Edith H. Kiewitt Scholarship Loan Fund. Provides loan funds for medical students.

Ophelia H. Kooden and Violet G. Sachs Loan Fund. Created in 1970 to provide loans for medical students in memory of the donors' brother, Jess Klement Goldberg.

Medical Scholars Loan Program. Established in 1985 by members of the William Greenleaf Eliot Society, this fund provides an interest-free source of long-term student loans. Annual contributions from alumni and friends support this perpetual and growing resource upon which current and future medical students will draw.

George W. Merck Memorial Loan Fund. Established in 1959 by The Merck Company Foundation, the original purpose of the loan was modified in 1983 to provide loans to graduating students which would help bridge the transition from student to resident physician.

National Direct Student Loan. A federal program to provide loans to students with financial need. Permits repayment over an extended period at a favorable interest rate.

Dr. William C. and Elva Pratt Loan Fund. Established in 1982 for medical students with a demonstrated financial need.

G. H. Reinhardt Memorial Scholarship Loan Fund. Established in 1947 through the bequest of G. H. Reinhardt.



Aline Rixman Loan Fund. Created in 1940 by William Rixman in memory of his wife, the fund is used to alleviate unexpected financial emergencies of medical students.

Caroline O. Schlesinger Loan Fund. Established in 1969 to provide financial support for medical students.

School of Medicine Student Loan Fund. Established to make loans to students with documented financial needs.

Washington University Medical Center Alumni Association Loan Fund. Provides emergency loans to medical students.

ASSESSING ACADEMIC ACHIEVEMENT

To assist students in evaluating their progress, each is graded in every course by the faculty. In the clinical and elective years, grades are accompanied by detailed descriptive comments characterizing each student's performance. This type of evaluative data is of considerable assistance to the student applying for internship or residency training, since it permits the Assistant Dean for Postgraduate Training to give each hospital to which the student has applied a meaningful, comprehensive summary of the candidate's attributes, abilities, and performance.

A Pass/Fail grading system is employed for the first trimester of the first year. At the conclusion of each academic year every student receives a grade report that indicates achievement in each course taken. When all the official grades have been received, the official transcript, in addition to listing courses and grades achieved, gives the grade distribution in each course with the exception of elective courses.

Grades are:

- H = Honors
- HP = High Pass
- P = Pass
- F = Fail
- DF = Deferred
- I = Incomplete

"Honors" is given for a truly outstanding performance, "High Pass" for very good work, and "Pass" for satisfactory work. "Fail" signifies clearly unsatisfactory performance. "Deferred" indicates a marginal performance with some deficiency that must be removed, and "Incomplete" denotes that course work has not been completed.

If a departmental coursemaster submits a grade of "Incomplete," "Deferred," or "Fail" for a medical student duly enrolled in any medical school course, the coursemaster will include an accompanying statement which contains the following information:

1. Student's name
2. Course title
3. Inclusive dates of course
4. Grade
5. Description of extent of academic encumbrance
6. Remedial action recommended to remove the academic encumbrance.

This type of statement will be submitted to the Office of the Registrar at the time student grades are reported and prior to the scheduled meetings of the various committees on academic review and promotions.

The grade of "F" or "DF" remains permanently recorded on the official academic record/transcript. The final grade reflecting a level of success in the course appears as an additional line entry on the record/transcript.

Tutorials and Individualized Programs

The educational program is designed to meet the needs of all medical students in an individual and a personalized way. To help students who may be having academic difficulty, individual tutorials are offered. The School's experience is that tutorials enable students to handle course work with improved proficiency. Students who are found to have difficulties in handling the normal academic course load will be asked to take an individualized program which would require five rather than four years to complete.

Rules Governing Promotions

A faculty Committee on Academic Review and Promotions reviews the records of all students by curriculum level.

Students must pass all required courses unless excused from their courses by the responsible departments. Students must have satisfactorily completed all the required courses for the first two years in order to be admitted to candidacy for the degree of Doctor of Medicine and to proceed to the third year of the curriculum.

Each student's performance will be evaluated periodically by a faculty Committee on Academic Review and Promotions. One such committee (CARP-I) is concerned with the first year, another (CARP-II) with the second year, and a third (CARP-III) with the clinical years of the curriculum. In the case of unsatisfactory progress, as evidenced by failing grades or an inability to develop adequate clinical expertise, the appropriate committee may require that the student be reexamined or repeat the relevant courses. If a student does not achieve or maintain a satisfactory level of scholarship, the committee may drop the student from the School. Any action to drop a student from the School will be the result of a determination by a CARP committee (on the basis of the student's performance and on the judgment of the members of the faculty who know the individual) that the student has demonstrated an inability to successfully complete the requirements of the School for the degree of Doctor of Medicine.

A decision by a CARP committee to drop a student from the School may be appealed. The appeal must be submitted, in writing, to the Dean of the School of Medicine within 72 hours of the student's receipt of notification of the committee's decision. Appeals will be considered within 30 days by a standing Appeals Committee appointed by the Dean. The Appeals Com-

mittee has limited authority either to uphold the earlier decision of the relevant CARP committee or to recommend to the Dean that the student be reinstated and allowed to continue his studies in the School. The reversal of a decision by a Committee on Academic Review and Promotions will be based only on a presentation of:

- (1) information which is new and/or different from that previously received by the CARP committee; or
- (2) evidence of extreme hardship of which the CARP committee was not fully apprised.

The Appeals Committee also serves for the Program in Occupational Therapy and the Program in Physical Therapy.

First Year Curriculum

The Committee on Academic Review and Promotions *may recommend* to any first-trimester student whose performance reflects difficulties with the required course work that he or she enter an individualized program. The Committee's recommendation will be based on a review of the student's performance in the first or second examinations in one or more of the major* first-trimester courses. The intent of such an individualized program is to permit the student an optimum chance of successfully completing the requirements for the first year by permitting up to two years to complete the first-year's work. Students who accept the Committee's recommendation will be permitted to withdraw from one, or at the most two, of the major courses taught in the first-trimester, and will be eligible for individual tutorial help in the remaining courses. At the end of the first-trimester the Committee *may require* a student who has failed one or more of the major courses to enter an individualized program.

A student who enters an individualized program is expected to pass all assigned courses in subsequent trimesters in the School of Medicine. Should a student in the first year of an individualized program fail any major course, one re-examination will be offered in each failed course at some time before the end of the summer preceding the next academic year. Should the student fail any re-examination, in the absence of such extenuating circumstances as personal ill health (physical or mental), he or she will be dropped from the School. Should a student in the second year of an individualized program fail more than two of the attempted courses, he or she will be dropped from the School. Should a student in the second year of an individualized program fail one or two of the attempted courses, a final re-examination in each failed course will be offered at some time before the end of the summer preceding the next academic year. If any such re-examination is failed, the student will be dropped from the School.

*The term "major courses" refers particularly to the first-year courses: Biochemistry, Gross Anatomy, Cell Biology, Physiology, Microscopic Anatomy, Neural Science, Immunology, Molecular Biology, and Microbiology and Infectious Diseases.

Second Year Curriculum

The Second Year Curriculum of the Washington University School of Medicine is divided into three twelve-week trimesters. Prior to the end of each trimester there is a reading period followed by an examination period. As soon as possible following each examination period, coursemasters in Pathology, Pharmacology, Pathophysiology and Preparation for Clinical Medicine report student grades to the Registrar's Office. The Committee on Academic Review and Promotions-II then meets and reviews the academic performance of all students in the Second Year Class particularly those students who are reported as having academic problems. The following guidelines are suggested for the re-examination of students who have failed trimester examinations:

1. Since Pathology, Pharmacology, and Preparation for Clinical Medicine are year-long courses, and since each of the three trimester examinations is cumulative, no re-examinations in these subjects are given until after the end-of-the-academic year meeting of CARP-II.
2. If a student fails one or more subjects in Pathophysiology, re-examination(s) will be offered according to the following schedule:

Failure(s) in	Re-examination Schedule
Trimester I	Re-examination(s) will be given during the first week after return from winter holiday break.
Trimester II	Re-examination(s) will be given during the first week after the spring break.
Trimester III	Re-examination(s) will be given during the last week of the interacademic year break.

Unless special permission is granted by CARP-II, a student in the Second Year Class may take re-examinations in no more than two subjects (e.g., Pathophysiology of the heart and kidney, or metabolism and pathophysiology of the lung) during each re-examination period. If a student fails initial trimester examinations in more than two subjects in Pathophysiology, re-examination(s) in these additional subject(s) must be deferred until after the end-of-the-academic year meeting of CARP-II.

3. At the end-of-the-academic year meeting of CARP-II, the academic records of all students in the Second Year Class will be reviewed. If a student has not taken an initial examination, or has not taken a re-examination in a subject(s) at the end of the appropriate trimester, the opportunity for examination or re-examination will be offered in each instance. CARP-II will determine for each student whether it is appropriate and practicable for the re-examination to be given during the last week of the three-week interacademic year period or whether the student should delay starting the clinical clerkship year for a variable time period for up to twelve weeks for the purpose of study and review. Stu-

dents will be provided tutorial assistance as determined by CARP-II.

4. If a student has failed the initial examination and failed a re-examination, e.g., in sections of Pathophysiology, at the discretion of CARP-II the student may either take a final re-examination at a prescribed time or repeat the course in the next academic year.
5. If a student, not on an individualized program, fails any final re-examination(s), CARP-II will determine whether the student should be dropped from the School of Medicine or permitted to repeat the specific course(s) during the next academic year.
6. If a student is in the third academic year of an individualized program and fails any final re-examination, the student will be dropped from the School of Medicine.
7. A student must take and pass or otherwise receive academic credit for all courses in the first two years of the curriculum before starting the clinical clerkships curriculum.

Beyond the Second Year Curriculum

The Committee on Academic Review and Promotions-III meets several times each year to review the academic progress of all students enrolled in the clinical clerkship and elective years. This includes students in the regular four-year M.D. program, students taking a five-year M.A./M.D. degree program, students in the clinical portion of the Medical Scientist Training Program, those selected students with a prior Ph.D. degree who have been approved by the Medical Science Training Placement Curriculum Committee for individualized curricula and are now in the clinical training period of their program and all others who have successfully completed all aspects of the School's pre-clinical curriculum. Before the end of each academic year, the Committee meets and recommends to the Executive Faculty those students who, in the opinion of the Committee, are qualified to receive the degree of Doctor of Medicine. Specific rules are as follows:

1. All academic encumbrances must be removed in order for a student to be recommended for graduation.
2. If a student does not achieve or maintain a satisfactory level of scholarship as determined by one or more departments in the School of Medicine, CARP-III may require the student to repeat a clerkship or elective, take a re-examination or may drop the student from the School.
3. The granting of the Doctor of Medicine degree indicates that, in the opinion of CARP-III, the student has the intellectual, personal and moral qualities and the integrity, commitment and sense of responsibility appropriate for the practice of medicine.



STUDENT LIFE

The St. Louis Scene

It comes as no surprise to residents—natives and newcomers alike—that St. Louis is considered to be among the 10 most livable areas in the United States. In health care, education, and transportation, St. Louis ranks among the top 20. For recreation, the lively arts, and great everyday living, St. Louis is a city of opportunity and variety.

The Gateway Arch—St. Louis' preeminent symbol—represents the joining of old and new on the historic Mississippi riverfront. Rising in front of a dramatic skyline, the Arch symbolizes St. Louis' role as the gateway to the West. Today, as in the past, St. Louis is a prominent cultural and commercial city, linking the north and south, east and west, through its traditions and its view of the future. The Arch itself, designed by Eero Saarinen, is a remarkable sculptural achievement and an incredible engineering feat, worthy of its dramatic setting. It frames the commercial center of downtown, and the Old Courthouse where in 1847 Dred Scott argued his right to be a free man.

Ambitious renovation and architectural experimentation characterize busy downtown St. Louis. The Old Post Office and the massive Romanesque Union Station are newly revitalized. Union Station now houses a hotel and expansive shopping mall, inviting convention visitors and tourists to explore commerce St. Louis-style. New corporate headquarters

buildings in the downtown display the variety of modern architecture evident in major metropolitan centers around the nation. Members of the Washington University School of Architecture consult with local firms in the creation of new structures and the refurbishing of the old. A new housing area in the fashionable Central West End, home to the Washington University Medical Center, is the design of a School of Architecture professor.

Though the St. Louis area has nearly 2.5 million residents, living here is simple and affordable. You are never farther than a 20-minute drive from any place you want to go in the metropolitan area, especially from Washington University's central location in suburban St. Louis. A convenient, modern highway system and a simple city plan allow easy access to all parts of the city and its many activities.

A keynote to St. Louis is variety. Any taste in housing, cuisine, lifestyle, and leisure activities can be found in the greater St. Louis area, but St. Louis is less expensive than comparable cities. Effective buying incomes of St. Louis households are 14 percent higher than the national average.

Attractive, affordable residential communities abound here, many of them within a two-mile radius of Washington University. The University is bordered by delightful neighborhoods. The Central West End, University City, and Clayton—all of which border Washington University—provide attractive housing and recreational opportunities. To the north, small shops, galleries, and ethnic restaurants dot the main street of University City. Adjacent to the Washington University Medical Center and the Hilltop campus is the Central West End, fashionable, trendy, and restored to its late-19th century grandeur. To the south are the elegant homes and multi-family dwellings of Clayton. For those who desire a more suburban lifestyle, west St. Louis county is a growing and beautiful area.

Cultural Opportunities

Once settled, new St. Louisans discover the rich recreational and cultural life here. You see the effects of the St. Louis renaissance in its theatre, galleries, and festivals. The St. Louis Symphony, second oldest and among the finest in the nation, performs at historic Powell Hall. Symphony members bring their skills to the community through teaching and chamber concerts as well. Several hold appointments in the Washington University music department. The music department also has close ties with the St. Louis Conservatory and Schools for the Arts (CASA), an institution offering high-level intense training in music and the arts. In the downtown area, the rich St. Louis traditions in jazz, blues, and ragtime music are continued in a number of lounges and clubs.

Broadway comes to St. Louis at the Fox Theatre, a \$2 million renovation of a 1929 example of exotic cinema temple art. Galleries sprinkled throughout the area bring the most current in visual arts to St. Louis and antique shops remind us of the past. St. Louisans tend to be avid movie goers. Supplementing the standard movie fare available throughout the metropolitan area are two theatres close to campus, the Tivoli and the Hi-Pointe, offering excellent foreign films.

Ten years old in 1985, the Opera Theatre of St. Louis has been enormously successful, nationally and internationally, bringing English-language versions of the classics and presentation of contemporary operas to the stage. The Repertory Theatre of St. Louis has an extensive annual season which includes experimental works and traditional dramas. The Theatre Project Company, City Players of St. Louis, and the Black Repertory Theatre enrich the dramatic offerings available in the immediate area, and right on campus the Edison Theatre offers a varied program each season.

When the St. Louis city art museum was built for the 1904 World's Fair, much of the Washington University collection was housed in it. Standing on a hill in Forest Park, the museum was called the jewel of the Fair. By 1929, it exhibited the entire University art collection and provided space for fine arts students and faculty shows.

Though in 1960 Washington University built its own museum—the Gallery of Art housed in Steinberg Hall—and moved its collection there, ties with the St. Louis Art Museum remain very close. Students in art and in business intern at the Art Museum working in arts management and gallery organization. St. Louis also features one of the world's few sculpture gardens, Laumeier International Sculpture Park. The park has 60 large-scale sculptures representing artists of international renown. St. Louis has two major historical museums as well: the Missouri Historical Society in Forest Park and the Museum of Westward Expansion under the Gateway Arch.

Recreation

For recreation, St. Louisans may use any of 93 parks which dot the metropolitan area. In Forest Park, which lies between the Washington University Medical Center and Hilltop campuses, are the Art Museum, MUNY Opera, the famed St. Louis Zoo, St. Louis Science Center's McDonnell Planetarium, the Jewel Box Floral Conservatory, three municipal golf courses, tennis and handball courts, a skating rink, and acres of paths, picnic areas, gardens, and wooded groves. Tower Grove Park is in south St. Louis, and adjoining it is the Missouri Botanical Garden, world famous for its research, collections, and facilities. The Garden's professional staff holds positions on the Washington University faculty and makes the extensive research facilities available to students.

Farther afield, St. Louis residents find outdoor adventure in the countryside beyond the city. In the Ozark Mountains, on the rivers of Missouri, on the lakes of neighboring Illinois, variety abounds. Camping, hiking, floating, rock climbing, and caving are among the many possibilities within a few hours' drive of St. Louis. For sailors, there is Lake Carlisle in Illinois. And for those with rod and reel, the Missouri streams are made-to-order.

The Washington University Athletic Complex, completed in 1985, is a full-service facility open to all members of the University community. It includes an 8-lane, 25-meter stretch pool, two complete gymnasiums, weight rooms, racquetball courts, a complete outdoor tennis complex, and a new track complex. Built on the site of the 1904 Olympic games, this state-of-the-art facility provides year-round recreational opportunities for students, faculty, and staff.

For the spectator, St. Louis is a splendid sports town. For over a century, it has hosted one of the oldest traditions in baseball—the St. Louis Cardinals. Dizzy Dean and the Gas House Gang, Lou Brock, Ozzie Smith, and Stan Musial are all part of Cardinal history. Busch Stadium, where the baseball Cardinals play, is also the home of the football Cardinals.

Traditionally, St. Louis is one of the great soccer cities in the country. It is the nation's high school and college soccer capital and has one of the most successful MISL franchises in the St. Louis Steamers.

The ice hockey book in St. Louis began when the Blues moved here in 1967. They have a winning history and play 40 games per year in the Arena.



Employment

St. Louis is a great place to work: job opportunities are varied and abundant; many companies are distinguished for their excellent working conditions, and commuting is easier than in many large cities.

Since the 1960s, the St. Louis area has enjoyed an influx of corporate headquarters and offices. Seventy-five Forbes 500 companies have offices in Clayton alone. In the nine-county region of St. Louis, more than 400 Fortune 1000 companies have a branch and 12 of the Fortune 500 are headquartered here. In addition, major insurance, retail, transportation, and banking organizations are in St. Louis. Among the top firms in town are Anheuser-Busch, The Brown Group, McDonnell Douglas, Monsanto, Pet and Ralston Purina—all founded in St. Louis. St. Louis is the major hub for Trans World Airlines. Since St. Louis is chosen so frequently as a headquarters location, many support services have grown around them—law, accounting, data processing, advertising, public relations, and design firms, as well as photographic and audio visual studios.

One of the very large employers is the Washington University Medical Center—composed of the Schools of Medicine and Dental Medicine and several teaching hospitals. Illustrative of the productive ties between university and community, the Monsanto Company supports molecular biology research at the School of Medicine and has contracted with Washington University for biomedical research.

The School of Business at Washington University enjoys a special relationship with the business community. As a laboratory for student study, for internship opportunities, and for permanent employment of business graduates, the St. Louis business community plays an integral role in the education of undergraduate and graduate business students. Faculty consultants work with corporations to develop new opportunities for growth and development of their firms. The local business and professional communities have also been very supportive of a new graduate internship program making part-time jobs available to advanced graduate students in the Humanities and Social Sciences Divisions of the Graduate School of Arts and Sciences.

Similarly, the School of Law has close ties with the St. Louis legal community and, through its clinical program, offers internships in private and local government offices and in state and federal courts. In addition, the law school is fortunate in the active and interested role of the local bar associations in the development of the school's special programs.

The George Warren Brown School of Social Work is also linked in many ways to the St. Louis social work community. Students find practicum assignments throughout the area and faculty both do research and consult with local agencies.

In short, Washington University, though a national research university, enjoys a close, even special relationship with the St. Louis area.

Housing

Those who come to St. Louis to be associated with Washington University School of Medicine find apartments which range in price from \$250-\$600 per month, all in the immediate area. The Apartment and Housing Referral Services, located in the Millbrook Building on the Hilltop Campus, maintains listing of housing appropriate for married and single students. For information, contact Apartment and Referral Services, Box 1059, Washington University, St. Louis, Missouri 63130 (Telephone: (314) 889-5092).

The Spencer T. Olin Residence Hall, located at 4550 Scott Avenue in the Medical Center, has accommodations for approximately 220 single men and women. The building was made possible by generous gifts from Spencer T. Olin and alumni and friends of the School of Medicine. Olin Hall is planned for the convenience of students in the medical or paramedical sciences. Every effort is made to provide an atmosphere that not only aids them in meeting their study obligations, but also recognizes their privileges as graduate students.

The rates for rooms during 1987-88 are:

School Year: September-June (Nine Months)

Two-room suite	\$2,592
Single room	\$1,890
Double room	\$1,278
Large single	\$2,340

Summer 1987: for Three Months

Two-room suite	\$864
Single room	\$630
Double room	\$426
Large single	\$780

Summer 1987: Weekly Rates for Student Visitor

Two-room suite	\$87
Single room	\$78
Double room	\$69

Daily Rates for Visitors

Two-room suite	\$37
Single room	\$30
Single room (prospective student)	\$26

Each occupant is required to pay a \$75 security fee and a \$10 key deposit in addition to the room rental charge. This fee will be held by the University until termination of residence to cover losses resulting from possible damage to the room or the furniture. Any portion not so used will be refunded.

Parking

Parking is available on lots owned and operated by the School of Medicine. These lots are located near Olin Hall and various other sites within the Medical Center. This includes the Busch lot which is fenced and shared equally by the School of Medicine and Barnes Hospital. An annual permit must be purchased for the use of any of the surface parking lots. These permits are available to students on a limited basis. Students also qualify to purchase monthly parking cards in the Washington University WayCo Garage at the corner of Audubon and Euclid Avenues.

Student Health Service

Entering students are required to have a medical examination prior to matriculation, and to show proof of immunity to measles (rubeola), rubella and mumps. Subsequent medical care is provided as long as they are enrolled in the School of Medicine. Physicians are available at the Student Health Service, and a physician is on call for emergency care at Barnes Hospital. Essential costs of hospitalization are covered. The student or his family is responsible for meeting the costs of hospital care in excess of those paid by the Health Service. The responsibility of the Student Health Service for hospitalization will end 30 days after an individual ceases to be an officially enrolled student.

Student Activities

Medical School Jazz Ensemble

The "Hot Docs," now in its ninth year of existence, is a fully instrumented big band jazz ensemble. The 20-member group, composed of predominantly Washington University medical students, rehearses weekly and performs at concerts and dances throughout the year. The band's large repertoire spans several musical generations, with the music of Miller, Dorsey, Basie, and Gillespie as well as present day jazz and pop composers represented.

The "Hot Docs" provide one of several ways students can continue to pursue long-time special interests in addition to their medical education.

Intramural Program

Students enrolled in the Washington University School of Medicine enjoy an active and diverse Intramural (IM) Program. The IM Program offers students the opportunity to participate in a wide range of sports. Utilizing the state-of-the-art facilities in the University's newly-constructed Athletic Complex, medical students pursue personal athletic interests and enjoy interaction with students enrolled in both undergraduate and graduate degree programs. Differences in curricular demands among participants are considered in scheduling games so that neither academic nor athletic goals are compromised.

Traditionally, the School of Medicine is represented each year by teams or individuals in over ten intramural sports. In the 1986-87 season, medical student teams competed in soccer, volleyball, swimming, track and field, ultimate frisbee, wrestling, flag football, basketball, softball, and wallyball. As evidence of their diverse abilities, the School's IM teams brought home championship T-shirts in the first six of these sports in either the mixed or graduate school divisions.

Student Organizations

Students at Washington University School of Medicine are active participants in medical student organizations on the local, state and national levels. The American Medical Student Association (AMSA), the American Medical Women's Association (AMWA), the Medical Student Section of the American Medical Association (AMA), the Missouri State Medical Association



(MSMA), and the Organization of Student Representatives (OSR) in the Association of American Medical Colleges (AAMC), provide forums for addressing the educational, social and political concerns of medical students. The School of Medicine supports student participation in these national organizations and provides on an annual basis funds for travel and other expenses.

On the local level, AMSA is the major student organization at the School of Medicine. The chapter's annual activities include a bi-weekly speaker series, a book sale for entering students, and several community service projects. In recent years, the service projects have included an ongoing blood pressure screening program done in conjunction with the American Heart Association, presentations to St. Louis area high school students on the effects of alcohol and drug abuse, and participation in health fairs sponsored by a variety of organizations in the city. In 1986, Washington University's AMSA chapter sponsored a regional conference on Access To Health Care which attracted students from eleven medical schools in 7 states.

Academic Societies

To foster communication between students and faculty, three academic societies—The Joseph Erlanger Society, The Carl and Gerty Cori Society, and the Oliver Lowry and Carl Moore Society—meet independently throughout the academic year to enjoy a social hour, dinner, and conversation stimulated by an after-dinner speaker. The Societies promote a collegial environment for the medical school's diverse faculty and student body.

Student Research Fellowships

No matter what medical career is chosen, it will be essential for the student to evaluate and use fresh knowledge throughout his or her professional life. Student Research Fellowships in basic science or clinical areas, awarded each year to selected students who undertake research projects under the direction of faculty members, are an important part of the educational program. Research allows students to discover firsthand the problems and rewards of obtaining and assessing new information, thus adding another dimension to their experience as investigators. Selected faculty members serve as advisors to students interested in special research opportunities.

Fellowships are available to students after acceptance into the School. They carry a stipend. The research must be undertaken during the student's free time or a vacation period for a minimum of two months. Application should be made to the Committee on Fellowships and Awards, Campus Box 8093.

Awards and Prizes

Washington University School of Medicine publicly recognizes and rewards at two annual events outstanding scholarship, research accomplishments and community service of individual students. In December, the Student Awards Luncheon acknowledges academic excellence earned during the first three years of study. As part of the festive commencement activities in May, graduates are recognized for meritorious research and clinical achievements accomplished during their medical school careers.

Alpha Omega Alpha Book Prize. Awarded at the end of the fourth year to a member of the graduating class who has performed outstandingly for the entire medical course.

Alexander Berg Prize. Awarded to the student presenting the best results in research in bacteriology.

Jacques J. Bronfenbrenner Prize. Provided by Dr. Bronfenbrenner's students in memory of his inspiration as a teacher and scientist, and awarded to the member of the graduating class who, in the judgment of the Chairman of the Department of Medicine, has done the most outstanding work in infectious diseases or related fields.

Dr. Richard Brookings and Dr. Robert Carter Medical School Prizes. Provided for medical students through a bequest of Robert S. Brookings.

Kehar S. Chouke Prize. Awarded at the end of the first year to a medical student who has demonstrated superior scholarship in anatomy.

GIBA Award for Outstanding Community Service. Recognizes a second-year student who has performed laudable extracurricular activity within the community.

Carl F. and Gerty T. Cori Prize in Biochemistry. Awarded at the end of the first year to the member of the class who has demonstrated superior scholarship in biochemistry.

Edmund V. Cowdry Prize in Histology. Established in 1969 to honor Dr. Cowdry; awarded to a medical student in the First Year Class who has performed meritoriously in microscopic anatomy.

Antoinette Frances Dames Prize in Physiology and Biophysics. Awarded annually to a member of the First Year Class who has demonstrated superior scholarship in these fields.

Elisabeth L. Demonchaux Prize in Pediatrics. Established in 1985, the prize is awarded annually to a graduating student who has done outstanding work in pediatrics.

George F. Gill Prizes. One prize awarded at the end of the first year to a member of the class who has demonstrated superior scholarship in anatomy; one prize awarded to a member of the graduating class who has demonstrated superior scholarship in pediatrics.

Alfred Goldman Book Prize. Created in 1972 as an annual award to be given to a student in the School of Medicine who, in the opinion of the faculty, has done outstanding clinical work or research in diseases of the chest or pulmonary physiology.

Max and Evelyn Grand Prize. Established in 1985 by Dr. M. Gilbert Grand, the prize is awarded annually to a medical student in the Fourth Year Class for excellence in ophthalmic research or clinical ophthalmology.

Isbiyaku EuroAmerica—Piccin Nuova Libreria Book Prize. Awarded for the first time at graduation in 1985, selection is based on general academic excellence throughout the recipient's medical education.

Dr. J. E. Kirk Scholastic Award. Established in 1975 and awarded to a graduating student of high scholastic standing.

Louis and Dorothy Kovitz Senior Prize in Surgery. Senior award prize in surgery recognizing a member of the Fourth Year Class who has shown the most outstanding ability, zeal, and interest in surgical problems.

Lange Medical Publications Student Awards. Given to members of all four classes for high scholastic standing.

Irwin Levy Memorial Fund. Established in 1980 by friends of Dr. Levy as a tribute to his commitment to clinical teaching. Provides a prize for the student who presents the best performance in the neurology and neurological surgery clerkship.

Oliver H. Lowry Prize. Awarded to a second-year medical student for academic excellence in pharmacology.

Howard A. McCordock Book Prize. Awarded at the end of the second year to a member of that class for general excellence in pathology.

McGraw-Hill Book Prize. Awarded annually to a medical student for outstanding achievement in the first-year curriculum.

Edward Massie Prize for Excellence in Cardiology. Awarded to the member of the graduating class who, in the judgment of the Director of the Division of Cardiovascular Disease of the Department of Medicine, has done the most outstanding clinical or basic research work in the field of cardiovascular disease.

Medical Center Alumni Scholarship Prize. Given annually to a student who has shown excellence in his or her work during the preceding year.

Medical Fund Society Prizes. One prize awarded annually to a student of the Fourth Year Class who has excelled in the study of internal medicine; one prize awarded annually to a student of the senior class who has excelled in the study of surgery. No individual is eligible for both prizes.

Minority Medical Students Scholarship Fund Awards. Awarded at the end of the first year to minority medical students, in recognition of academic excellence. Recipients are chosen by the Minority Medical Students Scholarship Fund Committee.

Missouri State Medical Association Award. A scroll and a U.S. Savings Bond presented annually to an honor graduate of the senior class.

C. V. Mosby Company Book Awards. Made to five members of the graduating class for high general scholastic standing and research achievement.

James L. O'Leary Neuroscience Prize. Awarded annually to students who demonstrate the best accomplishments in the neuroscience course.

James L. O'Leary Prize for Research in Neuroscience. Given annually to a predoctoral or postdoctoral student for the most original and important accomplishment in neuroscience research.

St. Louis Internists Club Book Prize. Awarded to the member of the graduating class who has done the most significant research in any area of internal medicine.

St. Louis Pediatric Society Senior Prize. Presented to the senior student showing the greatest promise in clinical pediatrics.

Sandoz Award. Given annually to a graduating student who has made a meritorious contribution to psychiatric research.

Sidney I. Schwab Prize in Psychiatry. Awarded at the end of the fourth year for general excellence in psychiatry.

John R. Smith Memorial Fund Prize. Created in 1982 to be awarded annually to a medical student who has done meritorious clinical and/or research work in the Division of Cardiovascular Disease of the Department of Medicine.

Margaret G. Smith Award. Given to a woman medical student for outstanding achievement in the first two years of medical school.

Samuel D. Soule Award in Obstetrics and Gynecology. Presented to a member of the Third or Fourth Year Class for meritorious achievement in either basic or clinical investigation in obstetrics and gynecology.

Upjohn Achievement Award. Given to the fourth-year student who has done the most meritorious work during his or her medical school career in the field of metabolism.

Washington University School of Medicine Academic Achievement Award. Given annually to a student who has exhibited to an unusual degree the qualities of industry, perseverance, determination, and enthusiasm in the first-year academic program.

Samson F. Wennerman Prize. Donated by his wife, Zelda E. Wennerman, and awarded annually to that fourth-year student who has demonstrated promise in surgery.

Hugh M. Wilson Award for Meritorious Work in Radiology. Given annually to a graduating medical student in recognition of outstanding work in radiology-related subjects, either clinical or basic science.

James Henry Yalem Prize in Dermatology. Established by Charles Yalem in memory of his son and awarded annually to a member of the Fourth Year Class for outstanding work in dermatology.

Lectureships and Visiting Professorships

Several established lectureships enable the School to bring to the Medical Center each year distinguished guests who contribute significantly to the richness of student life.

Harry Alexander Visiting Professorship. Established in 1964 by former house officers and friends of Dr. Harry Alexander to provide an annual visiting professor in the Department of Medicine.

Alpha Omega Alpha Lectureship. Given each year by a faculty member of the students' selection.

George H. Bishop Lectureship. Supported by funds made available by friends interested in the advancement of neurology.

Estelle Brodman Lectureship Fund. Established in 1981 by friends and colleagues of Dr. Brodman in honor of her distinguished contributions to the School of Medicine.

The James Barrett Brown Visiting Professorship in Plastic and Reconstructive Surgery. Created in 1969 by patients, friends, colleagues, and former students to honor Dr. Brown.

Thomas H. Burford Lectureship in Thoracic Surgery. Founded in 1971 by friends of Dr. Burford.

Glover H. Copher Lectureship in Cancer. Founded in 1971 with endowment provided by Dr. Copher and friends.

The Carl F. and Gerty T. Cori Visiting Professorship. Established in 1985 in honor of Nobel Laureates Carl and Gerty Cori by the Edward Mallinckrodt, Jr. Foundation, colleagues, faculty and former students.

I. Jerome Flance Visiting Professorship. Established in 1977 by former students and friends of Dr. Flance to provide annually a visiting professor in the Division of Pulmonary Diseases.

Julia Hudson Freund Lectureship. Established in 1982 by S. E. Freund in memory of his wife to provide a visiting lectureship in clinical oncology.

Edwin F. Gildea, Jr., Lectureship in Psychiatry. Established in 1978 by friends, colleagues, and former students of Dr. Gildea.

Joseph J. Gitt Visiting Professorship in Clinical Neurology. Established in 1971 by his family and friends to honor Dr. Gitt.

Graham Colloquium. A gift from Mr. and Mrs. Evarts Graham, Jr., in 1963 to encourage opportunities for students to expand their views on social, philosophical, artistic, and political topics.

The Evarts A. Graham Lecture. Established in 1985 by the Washington University Alumni of the Phi Beta Pi medical fraternity to honor the memory of Dr. Evarts A. Graham.

Evarts A. Graham Memorial Lectureship. Established in 1959 with a reserve fund left by Dr. Graham for his successors.

Evarts A. Graham Visiting Professorship of Surgery. Established in 1968 by The Harry Freund Memorial Foundation to support an annual lecture in honor of Dr. Graham's contribution to surgery.

Samuel B. Grant Visiting Professorship. Created in 1963 to provide annually a visiting professor in the Department of Medicine.

Carl Gayler Harford Lectureship. Established in 1977 by the family of one of Dr. Harford's patients in gratitude for his contributions to teaching clinical medicine and virology.

Alexis F. Hartmann, Sr., Lectureship. Established in 1960 by friends interested in pediatrics to provide an annual lecture in Dr. Hartmann's honor.

Michael and Irene Karl Lectureship in General Internal Medicine. Created in 1983 by Mr. and Mrs. Meyer Kopolow to provide an annual lectureship in honor of Drs. Michael and Irene Karl.

Paul E. Lacy Lectureship in Pathology. Established in 1987 by The Kilo Diabetes and Vascular Research Foundation in honor of Dr. Lacy's many contributions to pathology and diabetes research, and to recognize his collaboration over the years with the co-founders of The Kilo Foundation.

Irwin Levy Memorial Fund. Supports the Dr. Irwin Levy Visiting Lectureship in Neurology, which was established in 1978 by Mr. and Mrs. Meyer Kopolow.

Oliver H. Lowry Lectureship. Established in 1978 by friends, colleagues, and former students of Dr. Lowry.

Edward Massie Lectureship in Cardiovascular Disease. Established in 1981 by Edward J. Simon, M.D., Bernard Shanker, and other grateful colleagues and patients.

H. Relton McCarroll, Sr., Visiting Professorship in Orthopedic Surgery. Created in 1972 by patients, friends, colleagues, and former students in honor of Dr. McCarroll.

Carl V. Moore Lectureship. Established in 1973 by friends and patients of Dr. Carl V. Moore.

Carl A. Moyer Visiting Professorship of Surgery. Established in 1978 by The Harry Freund Memorial Foundation to support an annual lecture in honor of Dr. Moyer's contribution to surgery.

Joseph H. Ogura Lectureship. Established in 1977 by friends and colleagues of Dr. Ogura as a tribute to his numerous scientific accomplishments and contributions to the School of Medicine, graduate medical education, and commitment to patient care.

Rose and Samuel Pollock Surgical Lectureship. Established in 1976 by Dr. Joseph H. Pollock in memory of his parents.

The Probstin Oncology Lectureship. Established in 1985 by Mr. and Mrs. Norman K. Probstin in appreciation of professional services provided by William Fair, M.D., former head of the urology division of the Department of Surgery, and Carlos Perez, M.D., professor of radiology and head of radiation oncology at the Medical Center's Mallinckrodt Institute of Radiology.

Eli Robins Lectureship in Psychiatry. Established in 1977 by friends, colleagues, and former students of Dr. Robins.

St. Louis Football Cardinals Visiting Professorship in Orthopedic Surgery. Made possible since 1971 by donations from the St. Louis Football Cardinals.

Henry G. Schwartz Lectureship. Created in 1983 by former residents and colleagues from the neurosurgery department to honor Dr. Schwartz.

Wendell G. Scott Memorial Lectureship. Established in 1972 by friends and colleagues of Dr. Wendell G. Scott.

Major G. Seelig Lectureship. Established in 1948 in the field of surgery by friends of Dr. and Mrs. Seelig.

Philip A. Shaffer Lectureship. Founded in 1957 by friends of Dr. Shaffer in recognition of his accomplishments in biochemistry.

C. R. Stephen, M.D., FFAR.C.S. Fund for Lecture and Clinical Research in Anesthesiology. Established in 1986 by former students, residents, faculty and friends in honor of Dr. Stephen, first Head of the Department of Anesthesiology.

Sterling Drug Visiting Professorship in Pharmacology. Established in 1986 to honor Ernst Zander, M.D., former medical director of Sterling Drug, Inc.

The Donald B. Strominger Visiting Professorship. Established in 1984 by family, friends, and colleagues, fellows, and patients of Dr. Strominger in honor and in memory of his dedication and contributions to their lives, their careers, and to the field of medicine in pediatrics.

The Richard A. and Betty H. Sutter Visiting Professorship in Occupational and Industrial Medicine. Established in 1985 by Dr. and Mrs. Sutter to encourage opportunities for students, faculty, other physicians, and the St. Louis community to expand the understanding and practice of Occupational Medicine.

Jessie L. Ternberg Pediatric Surgery Visiting Lectureship. Made possible from a fund established in 1977 by Mr. Meyer Kopolow to honor Dr. Ternberg.

Robert J. Terry Lectureship (1939) and Visiting Professorship (1982). Established by alumni and Charles S. Terry, his son, respectively, "for the purpose of fostering greater appreciation of the study of anatomy."

Mildred Trotter Lectureship. Established in 1975 by friends and former students of Mildred Trotter to bring a distinguished woman scientist to the School of Medicine each year.

Rudolph A. Tuteur Pulmonary Lectureship. This lectureship is endowed by family, friends, patients, and colleagues of the Tuteur family to memorialize Rudolph A. Tuteur. The goal of this annual fall event is to promote further understanding of problems associated with chronic pulmonary disease from which he suffered.

THE WASHINGTON UNIVERSITY GRADUATE

Residency Training

Although not required by all states for licensure, postgraduate residency training in an approved hospital is considered essential preparation for the practice of medicine. Most Washington University graduates serve three or more years of residency training, and some will gain additional experience as postdoctoral fellows.

In order to aid students in obtaining desirable residency appointments, an active counseling program is maintained by the Associate Dean for Postgraduate Training. Thus, students in the Third Year Class are provided with general background information about the kinds of residencies available, special problems concerning certain extremely competitive residencies, and help in identifying faculty members for further assistance. Since the number of available residencies has recently decreased to approximately the same as that of graduates applying, students must make their choices with considerable care.

The Associate Dean for Postgraduate Training maintains an open file of brochures and other descriptive data regarding residencies throughout the country. Included are evaluations of the residency experience of our recent graduates. The School participates in the National Resident Matching Program, which offers distinct advantages to applicants.

Results of these efforts have been gratifying. In 1987, graduating students who participated in the National Residency Matching Program matched one of their top three choices in 86 percent of cases, with 62 percent obtaining their first choice of residency. The PGY-1 residencies selected in the most recent residency matching (1987) are identified in the Register of Students beginning on page 181.

The School maintains an active interest in its graduates and is pleased to assist them in subsequent years as they seek more advanced training or staff appointments in the communities in which they settle.

Postdoctoral Training

Those departments which offer Postdoctoral Fellowships individualize such educational activity up to a maximum of 36 months of academic time. Such fellowships lead integrally to certification by the appropriate specialty and/or subspecialty boards of the American Medical Association.

Fellowship And Other Funds

Alexander and Gertrude Berg Fellowship Fund. Created in 1952 through the bequest of Gertrude Berg to provide a fellowship in the Department of Microbiology.

Glover H. Copper Fellow in Surgical Research. Established in 1971 to support a postdoctoral fellow in surgery.

William H. Danforth Loan Fund for Interns and Residents in Surgery. Provides financial assistance in the form of loans for postdoctoral students in surgery.

J. Albert Key Fellowship Fund. Provides a stipend for a fellow in orthopedic surgery.

Louis and Dorothy Kovitz Fellowship Fund. Established in 1970 by an alumnus and his wife to provide support for research by qualified residents or students interested in surgery, at the discretion of the Head of the Department of Surgery.

Stephen I. Morse Fellowship. Established in 1980 by Carl and Belle Morse in memory of their son; awarded to predoctoral or postdoctoral students pursuing research careers in microbiology, immunology, and infectious diseases.

The Esther and Morton Wohlgenuth Foundation Fellowship. Established to support a fellow in the Division of Cardiovascular Diseases.

Continuing Medical Education

The study of medicine is a lifelong process with continuing medical education being an integral part of the continuum. Since 1973 the School of Medicine has formally met its obligations to this learning endeavor through the operation of the Office of Continuing Medical Education. The objectives of this program are:

- 1) To provide high quality educational activities for alumni of Washington University School of Medicine and other physicians regionally and, on occasion, nationally.
- 2) To encourage lifelong learning by a variety of educational methods appropriate to the learners' needs.
- 3) To provide for the acquisition of new knowledge and skills and to aid in acquiring efficient problem-solving techniques for ultimate improvement in patient care.
- 4) To provide a forum where academic and practicing physicians can jointly explore solutions to health problems.
- 5) To translate the results of research and the habits of critical assessment of new data to the needs of practicing physicians.

Each year 25 to 35 symposia on a wide variety of topics are sponsored by this office. About 3000 registrants attend these courses annually and receive more than 400 hours of instruction. In addition to formal courses, the CME office sponsors computer-assisted instruction, medical and pediatric newsletters, audiotapes, mini-residencies, and a speaker's bureau. It supports continuing medical education in selected community hospitals. The educational program is fully accredited by the Accreditation Council for Continuing Medical Education and provides credits to physicians seeking them for the Physician's Recognition Award of the American Medical Association, as well as various other types of state and specialty recertification and relicensure activities.



Washington University Medical Center Alumni Association

The Washington University Medical Center Alumni Association was organized more than 55 years ago to foster a spirit of class fellowship among its members, and to further the interests and standing of the School of Medicine. Membership is available to graduates and former house officers of the Medical Center.

In order to complement the aims and purposes of the School of Medicine, the Association sponsors a variety of programs including: student-alumni activities, recognition programs, alumni service programs, and other special events.

Student-Alumni Programs: The Washington University Medical Center Alumni Association Student Loan Fund underscores the commitment to assist deserving young men and women. Generous contributions made by members of the Association provide a special fund which offers short-term, no interest loans to medical students upon recommendation of the Office of Student Affairs.

To further alumni-student relationships, the Association coordinates the Alumni-Freshman Visitation Program, designed to give first-year medical students the opportunity to spend a day on the job with a practicing physician.

Pairing graduates just beginning their residency training with alumni in various cities is another beneficial program. This serves to acquaint the residents with their new surroundings and enhances the spirit of fellowship.

A tradition at the School of Medicine, the Association brings together alumni, faculty, and first-year students for a welcoming party during orientation week. The yearly New House Officer party provides for interaction with another group of newcomers to the Medical Center.

Recognition Programs: Alumni and friends of the School of Medicine who make unrestricted contributions of \$100 to \$249 to the School or any of its departments are recognized by membership in the Medical Century Club. The second level of club membership, the Century Club Fellows, recognizes those who contribute \$250 to \$499 annually in unrestricted support. Alumni and friends contributing \$500 to \$999 each year to ongoing programs at the School of Medicine are honored by Dean's Committee membership.

In 1977 members of the Medical Eliot Society, through the William Greenleaf Eliot Society of the University, initiated the Alumni Endowed Professorships Program, designed to establish Alumni Professorships through collective \$1,000 annual contributions from alumni. The first Alumni Professorship in Pharmacology was announced in 1982, the second in Pediatrics in 1985, and the third was completed in 1986. The goal is to have an Alumni Endowed Chair in each department at the School of Medicine. Recognizing the critical part which gifts play in the continued progress of Washington University, the William Greenleaf Eliot Society has established the following guidelines for donor recognition: Eliot Society Member, \$1,000—\$2,499; Eliot Society Fellow, \$2,500—\$4,999; Eliot Society Benefactor, \$5,000—\$9,999; Eliot Society Patron, \$10,000 or more.

Annually, Alumni-Achievement and Alumni-Faculty awards are presented at Reunion. Nominations for the awards, based on professional achievement and service to the School of Medicine, are solicited from all Reunion alumni. Reunion Chairmen, past award recipients and past presidents of the Alumni Association serve on the selection committee for the award recipients.

Alumni-Service Programs: The interest in postgraduate education expressed by leaders of the Alumni Association provided a major impetus to the initial development of the Office of Continuing Medical Education. Alumni in practice felt the need for a formal means to renew their educational experience under the auspices of their alma mater. Since establishment of the Office of Continuing Medical Education in 1973, alumni have supported its programs.

Biannually, the Alumni Association prepares and distributes the Washington University School of Medicine Alumni Directory. Members' names, specialties, and current addresses are contained in this publication.

The Network Cities Program presents special alumni activities in selected cities across the United States. Each event will be tailored to the interests of medical alumni in each metropolitan area. Programs have been established in Los Angeles, San Francisco, New York, and Houston. The objectives of this program are to realize maximum private financial support, to enroll the most competent students and residents, and to increase national awareness of the School's preeminence. A committee of volunteers from each area has been organized and trained to assist the School of Medicine in its efforts to increase major gift support and enact other programs to meet the stated objectives.

Special Alumni Programs: Alumni Reunion Days are in May and include a scientific program presented by the Office of Continuing Medical Education, individual class dinners, the Dean's Luncheon, and a Century Club breakfast. The Annual Alumni Dinner Dance honors the 50-year reunion class and the members of the graduating senior class.

Specialty receptions are hosted at national medical meetings and include the introduction of Medical Center faculty and distinguished guests.

The Washington University Medical Center Alumni Association endeavors to acknowledge the rationale for the School's development objectives, to add sufficiently to the School's endowment, and to sponsor programs that will foster a spirit of fellowship by reacquainting alumni with the continued vitality of their alma mater.

***DEPARTMENT OF
ANATOMY AND
NEUROBIOLOGY***



ANATOMY AND NEUROBIOLOGY

The anatomical sciences are presented in two courses: gross anatomy, offered in the first trimester, and microscopic anatomy, offered in the second trimester. A third course, neuroscience, is taught in the third trimester. Gross anatomy is taught essentially as a laboratory course, but with some lectures dealing with anatomical principles and with human growth and development. The course in microscopic anatomy consists largely of cell and tissue biology, with laboratory sessions paralleling the lectures in these areas. Neural science is taught mainly from an experimental point of view, with particular emphasis upon the structure and function of nerve cells and synapses and on the organization of selected neural systems. Throughout all three courses attention is paid to the results of recent investigations and to major developments in each field. In addition, the department offers a series of graduate courses which may be taken as electives by students in any of the four years. The department is well equipped for special work in several areas, including gross anatomy, electron microscopy, tissue culture, and all aspects of neurobiology.

FIRST YEAR

Bio 501. Human Anatomy

The course is based largely on the dissection of the human body. Lectures on functional and topographic anatomy emphasize the principles of organization of the various systems of the body. Lectures on developmental anatomy stress organogenesis as an adjunct to understanding the normal and abnormal anatomy. An extensive museum of labeled dissected specimens is housed in the dissecting room for ready reference by students who encounter abnormalities or variations in their dissections. Frequent use of x-ray films, cineradiography films, fresh organs, and cross sections aid in the synthesis of knowledge gained through dissection into clinically useful information. Radiologic anatomy and clinical correlation conferences further aid in this process. Occasional attendance at autopsies is recommended. Credit 6 units.

Bio 506. Microscopic Anatomy

The structure of cells, tissues, and organs is studied with regard to the functional significance of the morphological features. The laboratories consist of the study of prepared slides, of preparations of fresh tissues, and of electron micrographs. A microscope will be provided for each student. Credit 4 units.

Bio 554. Neural Sciences

This course provides a broad introduction to modern neuroscience, including the structure, function and metabolism of individual neurons, and a comprehensive overview of the structure and function of major systems in the central nervous system. Class time of



three half-days a week throughout the third trimester. A microscope will be provided for each student. Credit 5 units.

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas:

Growth and differentiation of muscle. *Dr. Bischoff*

Cell and developmental biology of excitable cells.

Dr. Bridgman

Developmental biology of nervous tissue.

Dr. M. Bunge

Cellular mechanisms in neural development, regeneration, and response to injury. *Dr. R. Bunge*

Anatomy and physiology of the somatosensory system.

Dr. Burton

Structure and function of neurotransmitter receptors.

Dr. J. Cohen

Comparative primate anatomy and primate evolution.

Dr. Conroy

Neurogenesis and synapse formation. *Dr. Fischbach*

Growth and differentiation of neuroblastoma and other malignant cell lines in culture. *Dr. Goldstein*

Development of neurotransmitter specificity in the brain. *Dr. Gottlieb*

Growth and differentiation of sympathetic neurons in culture. *Dr. Johnson*

Cellular biochemistry of peptide secreting neurons.

Dr. Krause

Developmental neurobiology. *Dr. Lichtman*

Central control of blood pressure and mechanisms of hypertension. *Dr. Loewy*

The structure and function of the skin. *Dr. Menton*

Development and gene regulation of catecholamine biosynthetic enzyme. *Dr. O'Malley*

Cross-sectional anatomy. *Dr. Peterson*

Primate population biology. *Dr. Phillips-Conroy*

The organization of the olfactory and limbic systems. *Dr. Price*

The formation and maintenance of synaptic connections in the mammalian nervous system. *Dr. Purves*

Genetic, molecular and physiological analysis of nervous system mutations. *Dr. Salkoff*

Molecules and structures that account for the specificity of synapse formation, especially at the neuromuscular junction. *Dr. Sanes*

Development of peptidergic neurons. *Dr. Taghert*

Physiology of posture and movement control. *Dr. Thach*

Axonal transport, cytoskeleton structure, and nerve regeneration. *Dr. Willard*

ELECTIVES

The department offers a number of graduate-level courses which may be taken as electives by medical students. The department participates in the Division of Biology and Biomedical Sciences, which also offers courses relevant to anatomy and neurobiology. These course descriptions are presented in the section on Biology and Biomedical Sciences.

Bio 5404. Molecular Neurobiology

Bio 5562. Neural Development

Bio 5571. Cellular Neurobiology

Bio 5651. Neural Systems

Bio 567. Advanced Tutorials in Neural Science

Note—The number preceding the course title indicates that the course is offered by the Division of Biology and Biomedical Sciences and carries credit in the Graduate School of Arts and Sciences.

Faculty

Edison Professor of Neurobiology and Head of Department

Gerald D. Fischbach, A.B., Colgate University, 1960; M.D., Cornell University Medical School, 1965.

Professor Emeritus

Mildred Trotter, A.B., Mount Holyoke College, 1920; Sc.M., Washington University, 1921; Ph.D., 1924; Sc.D. (hon.), Western College, 1956; Sc.D. (hon.), Mount Holyoke College, 1960; Sc.D. (hon.), Washington University, 1980. (See Department of Radiology.)

Beaumont-May Institute of Neurology Scholar in Anatomy and Professor

Richard P. Bunge, B.A., University of Wisconsin, 1954; M.S., 1956; M.D., 1960.

Professors

Joel E. Brown, B.S., Massachusetts Institute of Technology, 1960; M.A., 1960; Ph.D., 1964. (See Department of Ophthalmology.)

Mary B. Bunge, B.S., Simmons College, 1953; M.S., University of Wisconsin, 1955; Ph.D., 1960.

Harold Burton, B.A., University of Michigan, 1964; Ph.D., University of Wisconsin, 1968. (See Department of Cell Biology and Physiology.)

Theodore J. Cicero, B.S., Villanova University, 1964; M.S., Purdue University, 1966; Ph.D., 1968. (See Department of Psychiatry.)

Adolph I. Cohen, B.S., City College of New York, 1948; M.A., Columbia University, 1950; Ph.D., 1954. (See Department of Ophthalmology.)

Jonathan B. Cohen, B.A., Harvard College, 1966; M.A., Harvard University, 1967; Ph.D., 1972.

Glenn C. Conroy, B.A. (hon.), University of California, Berkeley, 1970; M.Phil., Yale University, 1972; Ph.D., 1974. (Also Faculty of Arts and Sciences.)

David I. Gottlieb, B.A., State University of New York, Binghamton, 1964; M.A., University of Wisconsin, 1969; Ph.D., Washington University, 1971. (See Department of Biological Chemistry.)

Boyd K. Hartman, A.B., University of Kansas, 1962; M.D., 1966.

Stephen M. Highstein, B.S., Rensselaer Polytechnic Institute, 1961; M.D., University of Maryland Medical School, 1965; Ph.D., University of Tokyo, 1976. (See Department of Otolaryngology.)

Arthur D. Loewy, B.A., Lawrence University, 1964; Ph.D., University of Wisconsin, 1969.

Robert F. Miller, M.D., University of Utah, 1967. (See Departments of Ophthalmology and Cell Biology and Physiology.)

Roy R. Peterson, A.B., University of Kansas, 1948; Ph.D., 1952.

Joseph L. Price, B.A., University of the South, 1963; Ph.D., Oxford University, 1969.

Dale Purves, A.B., Yale University, 1960; M.D., Harvard University, 1964.

W. Thomas Thach, Jr., A.B., Princeton University, 1959; M.D., Harvard University, 1964. (See Department of Neurology and Neurological Surgery.)

Mark B. Willard, B.A., Oberlin College, 1965; Ph.D., University of Wisconsin, 1971. (See Department of Biological Chemistry.)

Thomas A. Woolsey, B.S., University of Wisconsin, 1965; M.D., Johns Hopkins University, 1969. (See Departments of Neurology and Neurological Surgery and Cell Biology and Physiology.)

Associate Professors

C. Robert Almli, B.S., Michigan State University, 1966; M.A., 1968; Ph.D., 1970. (See Occupational Therapy.)

E. Richard Bischoff, A.B., Knox College, 1960; Ph.D., Washington University, 1966.

Mary L. Carlson, B.S., University of Wisconsin, 1961; M.A., Northwestern University, 1964; Ph.D., Tulane University, 1967. (See Department of Psychiatry.)

Milton N. Goldstein, B.S., Western Reserve University, 1946; M.S., 1947; Ph.D., 1952. (See Department of Pathology.)

Ursula W. Goodenough, A.B., Barnard College, 1963; M.A., Columbia University, 1965; Ph.D., Harvard University, 1969. (Also Faculty of Arts and Sciences.)

Mary I. Johnson, B.S., Washington State University, 1964; M.D., Johns Hopkins University, 1968. (See Departments of Neurology and Neurological Surgery and Pediatrics.)

David N. Menton, B.S., Mankato State College, 1959; Ph.D., Brown University, 1966. (See Department of Pathology.)

Jane Phillips-Conroy, B.A. (hon.), Brandeis University, 1969; M.A., New York University, 1973; Ph.D., 1978. (Also Faculty of Arts and Sciences.)

Joshua R. Sanes, B.A., Yale College, 1970; Ph.D., Harvard University, 1976.

Joseph Henry Steinbach, B.A., Reed College, 1968; Ph.D., University of California, San Diego, 1973. (See Department of Anesthesiology.)

Robert H. Waterston, B.S.E., Princeton University, 1965; M.D., University of Chicago, 1972; Ph.D., 1972. (See Department of Genetics.)

Research Associate Professors

Nancy L. Baenziger, B.A., St. Olaf College, 1967; Ph.D., Washington University, 1971.

Patti M. Nemeth, B.S., University of Arizona, 1969; Ph.D., University of California, 1977. (See Department of Neurology and Neurological Surgery.)

Assistant Professors

Mary Ann Boyle, B.S., University of Kansas, 1970; M.S. Ed., 1980; Ph.D., 1982. (See Occupational Therapy.)

Paul C. Bridgman, B.A., University of California, San Diego, 1974; M.S., 1976; Ph.D., Purdue University, 1980.

Andreas H. Burkhalter, B.S., University of Zurich, 1973; Ph.D., Brain Research Institute, University of Zurich, 1977. (See Department of Neurology and Neurological Surgery.)

William A. Frazier, A.B., Johns Hopkins University, 1969; Ph.D., Washington University, 1973. (See Department of Biological Chemistry.)

James E. Krause, B.S. (hon.), University of Wisconsin, Stevens Point, 1974; Ph.D., University of Wisconsin, Madison, 1980.

Jeff W. Lichtman, A.B., Bowdoin College, 1973; M.D., Ph.D., Washington University, 1980.

Bruce L. Nock, B.A., Elizabethtown College, 1969; M.A., Bucknell University, 1975; Ph.D., Rutgers University, 1980. (See Department of Psychiatry.)

Dennis D. M. O'Leary (Neurobiology), B.S., University of Illinois-Urbana, 1976; Ph.D., Washington University, 1983. (See Department of Neurology and Neurological Surgery.)

Karen L. O'Malley, B.A. (hon.), California State University of Sonoma, 1971; M.S., Portland State University, 1973; Ph.D., University of Texas, Austin, 1980.

Lawrence B. Salkoff, B.A., University of California, Los Angeles, 1967; Ph.D., University of California, Berkeley, 1979. (See Department of Genetics.)

Antoinette Steinacker, B.S., Western Maryland College, 1960; Ph.D., University of the Pacific, San Francisco, 1972. (See Department of Otolaryngology.)

Paul H. Taghert, B.A., Reed College, 1975; Ph.D., University of Washington, 1981.

Research Assistant Professors

W. Steven Adair, B.A., University of California, Los Angeles, 1970; M.S., California State University, San Diego, 1972; Ph.D., Wesleyan University, 1977. (Also Faculty of Arts and Sciences.)

Steven M. Rothman, M.D., State University of New York, Upstate, 1973. (See Departments of Pediatrics and Neurology and Neurological Surgery.)

Patrick M. Wood, A.B., Centre College of Kentucky, 1961; M.S., Purdue University, 1965; Ph.D., 1968.

Instructors

David A. Harris, B.S., Yale University, 1976; M.D., Ph.D., Columbia University, 1983.

Marc H. Schieber, A.B., Washington University, 1974; M.D., Ph.D., 1982. (See Department of Neurology and Neurological Surgery.)

DEPARTMENT OF ANESTHESIOLOGY



ANESTHESIOLOGY

According to the American Board of Anesthesiology, this specialty may be described as a practice of medicine which encompasses (1) the management of procedures for rendering a patient insensible to pain during surgical procedures, (2) the support of life functions under the stress of anesthetic and surgical manipulations, (3) the clinical management of the patient, unconscious from whatever cause, (4) the management of problems in pain relief, (5) the management of problems in cardiac and respiratory resuscitation, (6) the application of specific methods of inhalational therapy, and (7) the clinical management of various fluid, electrolyte, and metabolic disturbances.

With these objectives in mind, this department is dedicated to presenting to the student, as opportunities develop, (1) clinical applications of certain anatomic relationships, e.g., regional nerve blocks, (2) applications of principles of respiratory physiology, e.g., mechanics of ventilation under various circumstances,

cardiorespiratory resuscitation, (3) application of pharmacologic knowledge related to sedative, narcotic, and anesthetic drugs, and to compounds affecting the autonomic nervous system, (4) clinical problems related to acid-base, fluid, and electrolyte balance in surgical patients, and (5) principles underlying the approaches to the emerging concept of "acute medicine."

An elective in clinical anesthesiology is offered every four weeks for up to four students. The pharmacology of inhalation, intravenous, and local anesthetic drugs is demonstrated by practical application by the student in the operating room. The importance of blood gas determinations in evaluating the efficacy of ventilation is shown. Opportunities to develop proficiency in techniques such as endotracheal intubation are available. Students are expected to attend the regular anesthesia conferences and seminars.

A four-week elective is also offered in critical care medicine that is designed to familiarize the student with the diagnosis and treatment of the critically ill surgical patient. This is accomplished by the student becoming an integral part of the intensive care team.



Faculty

Mallinckrodt Professor and Head of Department

William D. Owens, B.A., Westminster College, 1961; M.D., University of Michigan, 1965.

Professors Emeriti

Albert Roos, M.D., University of Gronigen, 1940. (See Department of Cell Biology and Physiology.)

C. R. Stephen, B.S., McGill University, 1938; M.D.C.M., 1940.

Professors

Leonard W. Fabian, B.S., University of Arkansas, 1950; M.D., 1951.

Elsie F. Meyers, B.A., Indiana University, 1947; M.D., 1950. (See Department of Ophthalmology.)

Associate Professor Emeritus

Glenn R. Weygandt, B.S., University of Missouri, 1945; M.D., Washington University, 1947.

Associate Professors

James A. Felts, B.S., DePauw University, 1943; M.D., Northwestern University, 1946.

John E. Forestner, B.A., Northwestern University, 1966; M.D., 1970. (See Department of Pediatrics.)

Necita L. Roa, B.S., University of the Philippines, 1964; M.D., 1969.

Joseph H. Steinbach, B.A., Reed College, 1968; Ph.D., University of California, San Diego, 1973. (See Department of Anatomy and Neurobiology.)

Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Department of Cell Biology and Physiology and Biomedical Computer Laboratory.)

Associate Professor (Clinical)

Milton L. Cobb, B.A., Baylor University, 1964; M.D., University of Texas (Southwestern), 1968.



Assistant Professors

Nabil Abboud, B.A., Christian Brothers College, 1963; M.D., St. Joseph's University, 1970. (Jewish Hospital.)

Spomenko Bauer, M.D., University of Zagreb Faculty of Medicine, 1968. (Jewish Hospital.)

Donald J. Dickler, B.A., New York University, 1942; M.D., 1945. (Jewish Hospital.)

Alex S. Evers, B.S., Yale University, 1974; M.D., New York University, 1978. (See Departments of Medicine and Pharmacology.)

Robert Feinstein, B.E.E., Pratt Institute, Brooklyn, 1965; M.S., University of Michigan, 1967; Ph.D., 1968; M.D., Texas A. & M. University, 1982.

W. Patrick Gibson, B.A., Hendrix College, 1970; M.D., University of Arkansas, 1974.

Melvin Haber, B.S., Rutgers University, 1956; M.D., New York University, 1963. (See Department of Ophthalmology.)

Robert E. Herold, B.A., Wabash College, 1970; M.D., Washington University, 1974.

Gary E. Hirshberg, A.B., Princeton University, 1968; M.D., Hahnemann Medical College, 1972. (See Department of Pediatrics.)

Barbel Holtmann, B.S., University of Missouri, 1963; A.B., 1964; M.D., 1968.

James J. Jenkins, B.A., Duke University, 1966; M.D., University of North Carolina, 1970. (Jewish Hospital.)

Terri G. Monk, B.S., Wayne State University, 1973; M.D., University of Nebraska, 1977.

Carl H. Nielsen, M.D., Copenhagen Medical School, 1979.

Lawrence S. Waldbaum, A.B., Cornell University, 1969; M.D., Washington University, 1973. (Jewish Hospital.)

Mehernoor F. Watcha, M.B.B.S., Seth G.S. Medical College, 1972. (See Department of Pediatrics.)

Assistant Professor (Clinical)

M. Emin Kiyancilar, M.D., Ain-Shams University, 1970.

Instructors

Sidney J. Bennett, B.S., SUNY—Binghamton, 1975; M.D., Far Eastern University, Manila, 1980.

Michael T. Connor, B.S., Michigan Tech. University, 1970; M.D., Wayne State University, 1974. (See Department of Pediatrics.)

Catherine M. Dunn, B.A., University of Missouri, 1976; M.D., 1982.

Marshall Fay, B.S., Duke University, 1974; M.D., Medical College of Georgia, 1978. (Jewish Hospital.)

Joseph M. Forand, A.B., Hamilton College, 1977; M.D., St. Louis University, 1981. (Jewish Hospital.)

Barry A. Graff, B.A., MacMurray College, 1972; M.D., St. Louis University, 1976. (Jewish Hospital.)

Joel B. Gunter, B.S., University of Oklahoma, 1978; M.D., 1982. (See Department of Pediatrics.)

Patricia Hartwell, B.A., Johns Hopkins University, 1977; M.D., University of New Mexico, 1981.

Robert B. Holloway, B.S., LeMoyne College, 1952; M.D., Meharry Medical College, 1956. (St. Louis VA. Hospital.)

Vinod K. Kothapa, M.B.B.S., University of Mysore, 1976.

Ravi S. Kumar, M.B.B.S., Andhra University, 1973.

Robert C. Morrison, B.A., Harvard University, 1974; M.D., Tufts University, 1978.

Amrik S. Narula, M.B.B.S., H. P. Medical College, 1972.

James Vance Park, B.A., University of Colorado, 1978; M.D., Washington University, 1982.

Robert K. Parker, B.A., Springfield College, 1976; M.S., University of Connecticut, 1978; D.O., Kirksville College of Osteopathic Medicine, 1982.

S. Mark Poler, B.S., University of California, San Francisco, 1974; M.D., 1978.

Frank E. Robbins, B.A., Earlham College, 1973; M.D., Washington University, 1977. (Jewish Hospital.)

George E. Romkema, B.S., South Dakota State University, 1976; M.S., 1978; M.D., Medical College of Wisconsin, 1982.

James M. Shear, B.A., University of Missouri-St. Louis, 1977; M.D., University of Missouri-Columbia, 1981.

Susan S. Smith, B.S., Southern Methodist University, 1977; M.D., University of Texas-Houston, 1982. (See Department of Pediatrics.)

René Tempelhoff, M.D., University of Lyon, France, 1974.

Silvestre A. Tomeldan, B.S., Far Eastern University, 1964; M.D., 1970. (Jewish Hospital.)

Sudhakar Vaddi, M.B.B.S., Rangaraya Medical College, 1977.

Madhav Vinjamuri, M.B.B.S., Medical College of Gulbarga, 1971.

Gershon Ram Volotzky, M.D., Sackler Medical School, Tel Aviv, Israel, 1974. (Jewish Hospital.)

Carey I. Weiss, B.S., University of Illinois, Urbana, 1975; M.D., University of Illinois, Chicago, 1979.

Karen L. Weiss, B.A., M.D., Boston University, 1980.

Samuel Z. Westerfield III, B.S., Howard University, 1970; M.D., Columbia University, 1974.

Instructors (Clinical)

Sedat M. Ayata, B.S., Istanbul Lyceum, 1949; M.D., University of Istanbul, 1955.

Edwin T. de Castro, M.D., University of East College of Medicine, 1968.

Robert C. Engelhardt, B.S., University of South Carolina, 1946; M.D., University of Missouri, 1950.

Paul L. Friedman, B.A., Washington University, 1953; M.D., 1957.

Robert Hellman, B.A., Yeshiva University, 1969; M.D., New Jersey College of Medicine and Dentistry, 1973.

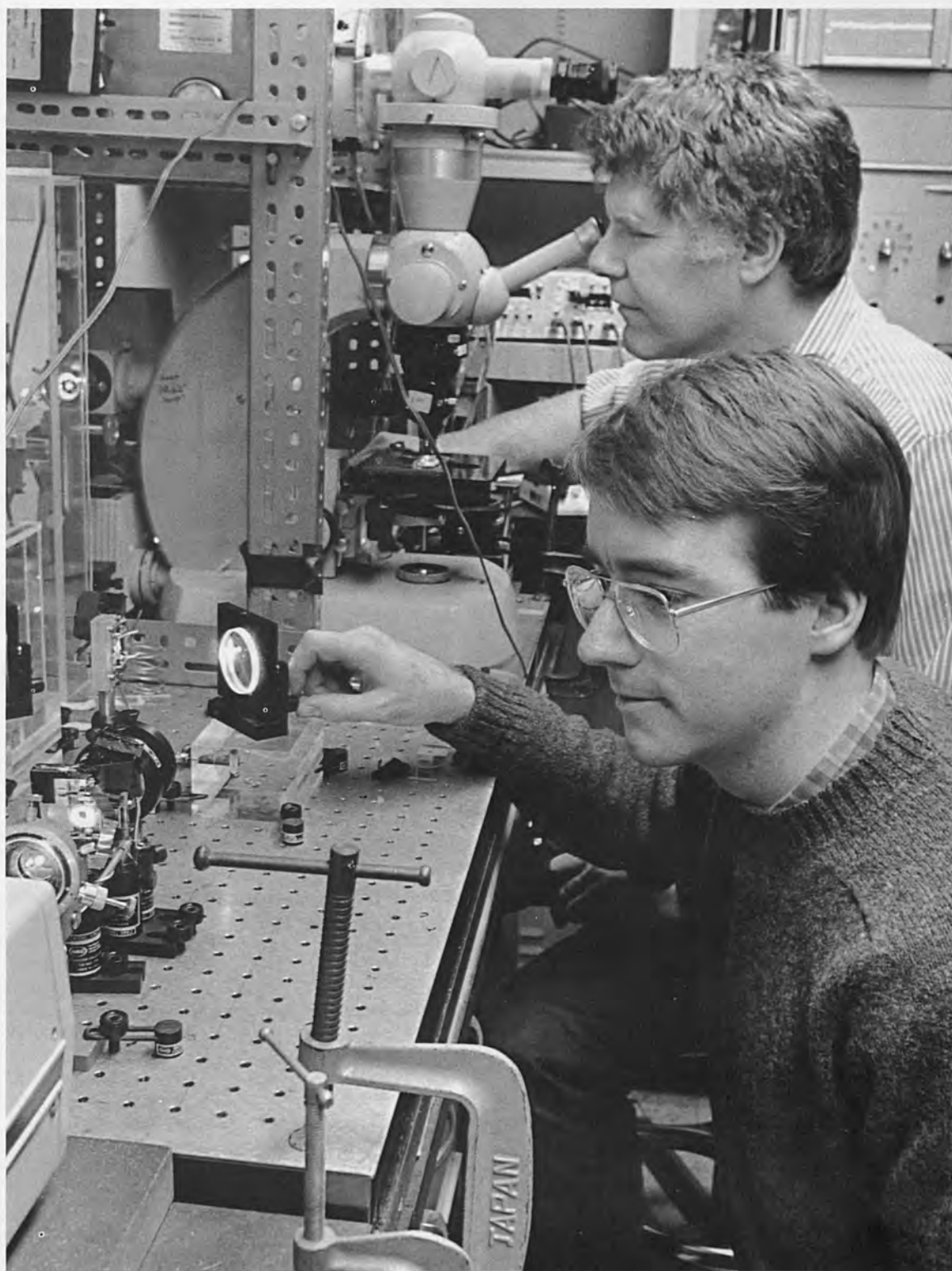
Akira Iwane, M.D., Nihon University, 1966.

Edgardo Mayuga, M.D., University of Santo Tomas, 1960.

Dorothy S. Perry, B.A., Swarthmore College, 1973; M.D., St. Louis University, 1977.

William A. Sims, Jr., B.S., University of Missouri, 1955; M.D., Washington University, 1957.

**DEPARTMENT
OF BIOLOGICAL
CHEMISTRY**



BIOLOGICAL CHEMISTRY

The department offers an advanced course in biochemistry as well as several specialized courses in the major fields of biochemistry. Students of medicine or those in the Graduate School of Arts and Sciences may enroll in these courses or pursue research work under the direction of members of the faculty. The interests of the faculty, listed below, cover many aspects of biochemistry and biophysics with special emphasis on structure/function relationships in proteins, enzymology, metabolic regulation, molecular biology of gene expression and protein biosynthesis, lipid metabolism, and the dynamics of cytoskeletal proteins.

FIRST YEAR

Bio 531. Biochemistry

An introductory section on elementary biochemistry is provided for students without previous background in the field. This is followed by an in-depth consideration of metabolic regulation pertaining to major biochemical processes. A series of mini courses devoted to special topics of biological and medical interest involve extensive reading of the original literature and active student participation. Credit 4 units.

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas of biochemistry:

X-ray analysis of protein structure; structure and mechanism of enzymes, lipoproteins. *Dr. Banaszak*

Genetic engineering of plants to express useful bacterial genes; DNA sequence analysis. *Dr. Barnes*

Biochemical investigation of metabolic disorders of carbohydrate metabolism. *Dr. B. Brown*

Studies of pathways of carbohydrate metabolism in mammalian tissues. *Dr. D. Brown*

Molecular biology of yeast; control and fidelity of chromosomal DNA replication. *Dr. Burgers*

Physical studies of enzyme reaction mechanisms. *Dr. Drysdale*

Interactions between cell surface and cytoskeleton. Mobility of molecules in animal cell surfaces. Forces and mechanisms which determine cell shape and cellular viscoelasticity. *Dr. Elson*

Structure and function of macromolecules involved in platelet aggregation and gene expression in vascular cells. *Dr. Frazier*

Actin polymerization and actin binding proteins. Enzyme kinetic theory and enzyme mechanisms. Protein-protein interactions. *Dr. Frieden*

Regulation of gene expression in the developing and adult intestine; biosynthesis and compartmentalization of gut proteins; protein myristoylation: mechanisms, effects on protein targeting and cell metabolism.

Dr. J. Gordon

Protein chemistry; protein sequence analyses; structure and function of enzymes—collagenases, dehydrogenases, serine proteases; site specific mutagenesis.

Dr. Grant

Computer methods in biochemistry and mass spectrometry. Modelling the development of multicellular structures. *Dr. Holmes*

Structure of the oligosaccharides of soluble and membrane glycoproteins and their interactions with lectins.

Dr. R. Kornfeld

Transcriptional regulation of retroviral gene expression. *Dr. Majors*

Mechanism of action of growth factors; phosphorylation of proteins on tyrosine, turnover of phosphatidylinositol. *Dr. Pike*

Membrane lipid synthesis, assembly and function in eukaryotes. Phospholipid domains in biological membranes. *Dr. Silbert*

Gene structure and protein biosynthesis in eukaryotes. Cloning, translation and compartmentalization of secretory, mitochondrial, and membrane protein.

Dr. Strauss

ELECTIVES

Descriptions of the elective courses are listed under the Division of Biology and Biomedical Sciences. In some instances, these courses are offered in alternate years. The faculty member in charge of the course should be contacted for specific times.

Bio 5291. Intracellular Mediators and Regulation of Cellular Function

Bio 5301. Laboratory Computer Programming

Bio 532. Biochemistry of the Extracellular Matrix

Bio 5341. Principles of Gene Manipulation

Bio 5351. Molecular Biology

Bio 537. Protein Chemistry and Enzyme Mechanisms

Bio 538. Structure and Function of Cell Membranes and Surfaces

Bio 5451. Introductory Biophysical Chemistry

Bio 548. Nucleic Acids and Protein Biosynthesis

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

Professor and Interim Head of Department

Carl Frieden, B.A., Carleton College, 1951; Ph.D., University of Wisconsin, 1955.

Professor Emeritus and Lecturer

David H. Brown, B.S., California Institute of Technology, 1942; Ph.D., 1948. (See Administration.)

Professor Emeritus

William F. Holmes, A.B., Princeton University, 1953; Ph.D., University of Pennsylvania, 1960. (See Biomedical Computer Laboratory.)

Professors

Leonard J. Banaszak, B.S., University of Wisconsin, 1955; M.S., Loyola University, 1960; Ph.D., 1961. (See Department of Cell Biology and Physiology.)

Barbara I. Brown, B.A., Smith College, 1946; Ph.D., Yale University, 1950.

Jonathan B. Cohen, B.A., Harvard College, 1966; M.A., 1967; Ph.D., 1972. (See Department of Anatomy and Neurobiology.)

Thomas F. Deuel, A.B., Princeton University, 1957; M.D., Columbia University, 1961. (See Department of Medicine.)

George R. Drysdale, B.S., Birmingham-Southern College, 1948; M.S., University of Wisconsin, 1950; Ph.D., 1952.

Sarah C. R. Elgin, B.A., Pomona College, 1967; Ph.D., California Institute of Technology, 1971. (Also Department of Biology.)

Elliot L. Elson, B.A., Harvard College, 1959; Ph.D., Stanford University, 1966.

William A. Frazier, A.B., Johns Hopkins University, 1969; Ph.D., Washington University, 1973. (See Department of Anatomy and Neurobiology.)

Rosalind H. Kornfeld, B.S., George Washington University, 1957; Ph.D., Washington University, 1961. (See Department of Medicine.)



Stuart A. Kornfeld, A.B., Dartmouth College, 1958; M.D., Washington University, 1962. (See Department of Medicine.)

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Medicine.)

Garland R. Marshall, B.S., California Institute of Technology, 1962; Ph.D., Rockefeller University, 1966. (See Department of Pharmacology.)

F. Scott Mathews, B.S., University of California, 1955; Ph.D., University of Minnesota, 1959. (See Department of Cell Biology and Physiology.)

Blake W. Moore, B.S., University of Akron, 1948; Ph.D., Northwestern University, 1952. (See Department of Psychiatry.)

William R. Sherman, A.B., Columbia University, 1951; Ph.D., University of Illinois, 1955. (See Department of Psychiatry.)

David F. Silbert, A.B., Harvard University, 1958; M.D., 1962.

Arnold W. Strauss, B.A., Stanford University, 1966; M.D., Washington University, 1970. (See Department of Pediatrics.)

Robert E. Thach, A.B., Princeton University, 1961; Ph.D., Harvard University, 1964. (Also Faculty of Arts and Sciences.)

Joseph J. Volpe, B.A., Bowdoin College, 1960; M.D., Harvard University, 1964. (See Departments of Neurology and Neurological Surgery and Pediatrics.)

James C. Warren, A.B., University of Wichita, 1950; M.D., University of Kansas, 1954; Ph.D., University of Nebraska, 1961. (See Department of Obstetrics and Gynecology.)

Professors (Adjunct)

Luis Glaser, B.A., University of Toronto, 1953; Ph.D., Washington University, 1956.

Howard A. Schneiderman, B.A., Swarthmore College, 1948; Ph.D., Harvard University, 1952.

Associate Professors

Wayne M. Barnes, A.B., University of California, 1969; Ph.D., University of Wisconsin, 1974.

Oscar P. Chilson, B.S., Arkansas State Teachers College, 1955; M.S., University of Arkansas, 1958; Ph.D., Florida State University, 1963. (Also Faculty of Arts and Sciences.)

Jeffrey I. Gordon, A.B., Oberlin College, 1969; M.D., University of Chicago, 1973. (See Department of Medicine.)

David I. Gottlieb, B.A., State University of New York, Binghamton, 1964; M.A., University of Wisconsin, 1969; Ph.D., Washington University, 1971. (See Department of Anatomy and Neurobiology.)

John J. Jeffrey, Jr., B.S., College of the Holy Cross, 1958; Ph.D., Georgetown University, 1965. (See Department of Medicine.)

Mark B. Willard, B.A., Oberlin College, 1965; Ph.D., University of Wisconsin, 1971. (See Department of Anatomy and Neurobiology.)

**Research Associate
Professor**

Carl D. Rhodes, A.B., University of North Carolina at Chapel Hill, 1963; Ph.D., The Johns Hopkins University, 1971.

Assistant Professors

Peter M.J. Burgers, B.Sc., State University of Leiden, The Netherlands, 1969; M.S., 1972; Ph.D., 1977.

Gregory A. Grant, B.S., Iowa State University, 1971; Ph.D., University of Wisconsin, 1975. (See Department of Medicine.)

Robert C. Landick, B.S., University of Michigan, 1975; Ph.D., 1983. (Also Department of Biology.)

Ellen Li, B.S., Stanford University, 1974; Ph.D., M.D., Washington University, 1980. (See Department of Medicine.)

Robert L. Low, A.B., University of California, 1970; Ph.D., University of Chicago, 1975; M.D., 1977.

John A. McDonald, B.S., University of South Florida, 1965; M.S., University of Florida, 1967; Ph.D., Rice University, 1973; M.D., Duke University Medical School, 1973. (See Department of Medicine.)

John E. Majors, B.S., University of Washington, 1970; Ph.D., Harvard University, 1977.

Linda J. Pike, B.S., University of Delaware, 1975; Ph.D., Duke University, 1980.

J. Evan Sadler, A.B., Princeton University, 1973; Ph.D., Duke University Medical Center, 1978; M.D., 1979. (See Department of Medicine.)

Douglas M. Tollefsen, B.A., Grinnell College, 1970; Ph.D., M.D., Washington University, 1977.

**Research Assistant
Professors**

Jens J. Birktoft, Cand. Scient., University of Copenhagen, Denmark, 1967.

Linda C. Kurz, A.B., Washington University, 1967; Ph.D., 1973.

Andrew N. Tyler, B.Sc., University of Manchester, 1979; Ph.D., University of Manchester Institute of Science and Technology, 1982. (See Department of Medicine.)

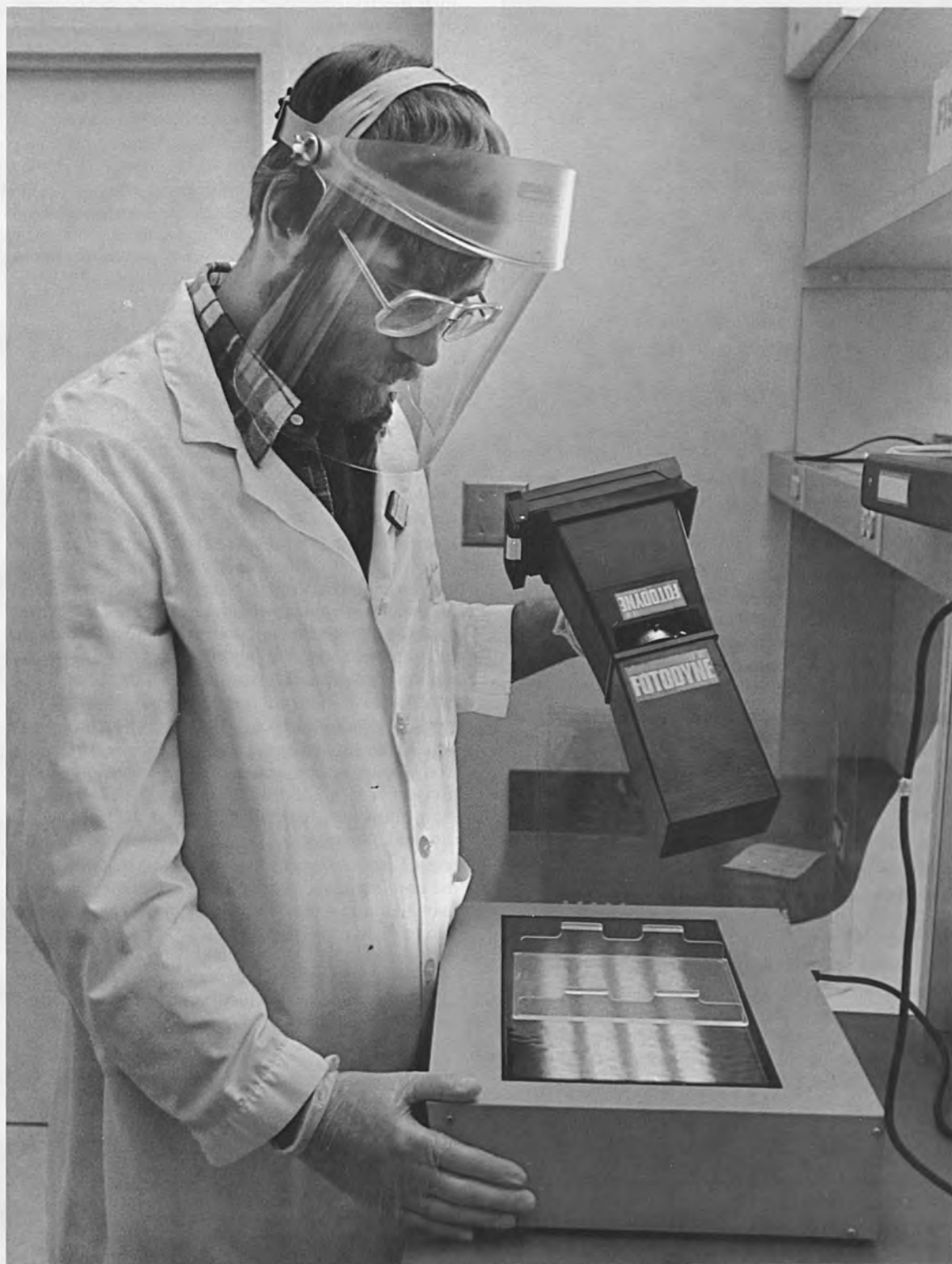
Research Instructors

Kenneth Denson, A.B., Occidental College, 1971.

Mark Freeman, B.S., Washington University, 1981; M.S., 1985.

Walter L. Nulty, Jr., B.A., Southern Illinois University, 1956.

**DEPARTMENT OF
CELL BIOLOGY
AND
PHYSIOLOGY**



CELL BIOLOGY AND PHYSIOLOGY

The department offers instruction to medical and graduate students. A Cell Biology course in the first trimester of the first year of the medical curriculum deals with introductory cell physiology, and cellular biophysics. A Physiology course in the second and third trimesters of the first year is designed to provide students with a foundation for their further study of clinical and applied physiology. The department also offers a Neural Sciences course (jointly with Anatomy and Neurobiology) in the third trimester dealing with the anatomy and physiology of the nervous system. In addition, advanced courses open to medical and graduate students provide for more detailed study of specific areas of cell biology, physiology, and cellular biophysics.

The following research interests are represented in the department at the present time: macromolecular structure as studied by x-ray crystallography and other physical methods, the mechanism of action of polypeptide hormones, transport across cell membranes, epithelial transport, intracellular transport, secretion and uptake of macromolecules, and renal physiology, neurophysiology, contractile activation of muscle, peripheral circulation, respiration, and the application of computer techniques to biological problems. Electron microscopy of nerve and muscle is used to relate structure and function in these tissues.

FIRST YEAR

Bio 502. Physiology

This course integrates and extends the basic principles of cell biology and physiology to the functions of the major organ systems of the body, i.e., muscle, cardiovascular, renal, respiratory, gastrointestinal and endocrine. Credit 6 units.

Bio 554. Neural Sciences

An integrated course dealing with the anatomy and physiology of the nervous system at the cellular level, leading on to a consideration of sensory and motor systems. Credit 5 units.

Bio 5061. Cell Biology

A course covering fundamental aspects of cell organization and physiology. Credit 3 units.

RESEARCH

Bio 590. Research Opportunities

The department offers a variety of research opportunities, particularly in the following areas: macromolecular structure as studied by x-ray crystallography; synthesis and biological activities of polypeptides; membrane transport; lysosomes and intracellular

transport; neurophysiology, including nerve membrane, muscle, synaptic transmission, sensory systems (especially auditory and visual), electron microscopy of neural tissues, and biochemical regulation in neurons; circulation; respiration; renal physiology; and the application of computer sciences to physiological problems.

Developmental regulation of complement biosynthesis in human mononuclear phagocytes. Molecular and cellular mechanisms which account for plasma protein deficiencies, role of mononuclear phagocytes in inflammation and organ development.

Dr. F. Sessions Cole

Development of the visual system; effects of visual deprivation on this development; and the function of synaptic transmitters in the visual system.

Dr. Nigel W. Daw

Physiology of cell membranes: kinetics, energetics, and pharmacology of active and passive movements of ions (Na^+ , K^+ , Mg^{2+}) across cell membranes.

Dr. Paul De Weert

Mechanisms of sensory transduction in muscle receptors. *Dr. Y. Fukami*

Development of new methods for visualizing cells and molecules in three dimensions by means of electron microscopy, and for capturing macromolecular mechanisms through rapid freezing techniques.

Dr. John E. Heuser

Sensory transduction and efferent regulation in the isolated mammalian muscle spindle; motor innervation of skeletal muscle (motor unit types and contractile response). *Dr. C. Hunt*

Electrophysiology of calcium channels. Neuronal, heart or skeletal muscle cells are grown in tissue culture and currents carried by calcium channels are measured using patch clamp techniques. Aims are to describe the mechanism of the channel's selectivity for calcium and to explore modulation of channel function by hormones and neurotransmitters.

Dr. Edwin McCleskey

Studies of protein structure and function. Current research interest focuses on proteins involved in electron transfer interactions, oxidation-reduction reactions and recognition. Methods employed include x-ray diffraction, molecular modeling and site-directed mutagenesis. *Dr. F. Scott Matheus*

Identification of environmental factors that influence the developmental phenotype of cells, concentrating mainly on the role of extracellular matrix in initiating differentiation and in maintaining appropriate gene expression in the differentiated phenotype. Role of the cell membrane in recognition of the inductive signals. Characterization of specificity and mechanistic pathway of intracellular signal transduction from receptors at the cell surface to controlling elements on genes.

Dr. Robert Mecham

Structure and function of cation transport proteins. Molecular biology of the Na, K-ATPase. Identification and characterization of NA, K-ATPase isoforms using *in situ* hybridization. *Dr. Robert Mercer*

Patch clamp characterization of ion channels involved in stimulus-secretion coupling in neurons and endocrine cells (e.g. ATP sensitive K^+ channels, Ca^{2+} activated K^+ channels, stretch activated cation channels).

Dr. Stanley Misler

Research in peripheral auditory mechanisms. Development of theory of asynchronous circuits and systems. Design of specialized computer equipment for biomedical applications, such as collection, analysis, and modeling.

Dr. Charles E. Molnar

Molecular biology of the mammalian glucose transporter. Gene structure, biosynthesis and regulation. Expression of transfected cDNA in foreign cells. Mechanism of insertion of proteins into the rough endoplasmic reticulum membrane.

Dr. Mike Mueckler

Chemical communication and function in the cerebral cortex, with emphasis on the visual system. Analysis of neurotransmitter receptor properties with radioligand binding and second messenger assays. Neurochemical adaptations to changes in activity, using the peptidergic and aminergic neurons of the retina as model systems.

Dr. David Parkinson

Regulation of protease-antiprotease balance at the cellular level. Effect of mediators of acute inflammation and sex steroid hormones on human hepatic gene expression.

Dr. David Perlmutter

Tissue culture and immunohistochemical studies of neuronal migration in the developing mammalian cerebral cortex.

Dr. Alan L. Pearlman

Transmembrane movements of H^+ ions. Regulation of intracellular pH, using electrophysiological methods.

Dr. Albert Roos

Neurophysiology of the lamprey brain and spinal cord. Properties of brain endothelium.

Dr. Carl M. Rovainen

Intracellular motility studies using *in vitro* reconstitution of motile processes. Control of vesicle motility in fast axonal transport, endocytosis and exocytosis. Energetic and nanometer scale video analyses of kinesin and myosin dependent motility.

Dr. Michael P. Sheetz

Study of the physiologic basis of human neutrophil function: the role of ion movements in the cellular responses to chemotactic factors and other stimuli.

Dr. Louis Simchowicz

Regulation of receptor biosynthesis and deployment. Mechanism of receptor internalization and recycling. Physiologic role of receptors which recognize sugar residue on proteins and on other cells.

Dr. Philip D. Stahl

Computer-based acquisition and analysis of biologic signals via digital signal processing techniques.

Dr. Lewis J. Thomas, Jr.

Mechanisms of receptor-mediated endocytosis. Intracellular transport and sorting of membrane proteins.

Dr. Thomas Wileman

Physiology of skeletal muscle and nerve-muscle synapses, especially the role of innervation in determining muscle cell properties.

Dr. Robert S. Wilkinson



ELECTIVES

Descriptions of the following courses may be found under the Division of Biology and Biomedical Sciences.

Bio 459. Vision

Bio 511. Intracellular Transport of Macromolecules in Animal Cells

Bio 525. Fundamental Concepts in Cell Membrane Physiology and Biophysics

Bio 526. Selected Topics in the Physiology and Biophysics of Cell Membranes

Bio 552. Topics in Neurobiology

Bio 559. Nerve, Muscle, and Synapse

Bio 5651. Neural Systems

Bio 567. Advanced Tutorials

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences. See course descriptions in the Graduate Training section of this catalog.

Faculty

Edward Mallinckrodt, Jr. Professor and Head of Department

Philip D. Stahl, B.S., West Liberty State College, 1964; Ph.D., West Virginia University, 1967.

Professors Emeriti

Hollowell Davis, A.B., Harvard University, 1918; M.D., 1922; Sc.D., (hon.), Colby College, 1954; Sc.D., (hon.), Northwestern University, 1962; Sc.D. (hon.), Washington University, 1973. (See Department of Otolaryngology.) (Also Lecturer.) (Also Central Institute for the Deaf.)

Arthur S. Gilson, Jr., B.S., Dartmouth College, 1919; A.M., Harvard University, 1922; Ph.D., 1924.

Stanley Lang, Ph.B., University of Chicago, 1948; B.S., 1949; M.S., 1951; Ph.D., 1953.

Lecturer

Albert Roos, M.D., University of Groningen, 1940. (See Department of Anesthesiology.)

Professors

Joel E. Brown, B.S., Massachusetts Institute of Technology, 1960; M.S., 1960; Ph.D., 1964. (See Departments of Ophthalmology and Anatomy and Neurobiology.)

Jerome R. Cox, Jr. (Biomedical Engineering), S.B., Massachusetts Institute of Technology, 1947; S.M., 1949; Sc.D., 1954. (See Biomedical Computer Laboratory.) (Also School of Engineering and Applied Science.)

Nigel W. Daw, B.A., Trinity College, Cambridge, 1956; M.A., 1961; Ph.D., Johns Hopkins University, 1967. (See Department of Ophthalmology.)

Paul J. De Weer, B.S., University of Louvain, 1959; M.D., 1963; M.S., 1964; Ph.D., University of Maryland, 1969.

John E. Heuser, B.A., Harvard College, 1964; M.D., Harvard University, 1969.

Carlton C. Hunt, B.A., Columbia University, 1939; M.D., Cornell University, 1942. (See Department of Neurology and Neurological Surgery.)

F. Scott Mathews, B.S., University of California, 1955; Ph.D., University of Minnesota, 1959. (See Department of Biological Chemistry.)

Robert F. Miller, M.D., University of Utah, 1967. (See Departments of Ophthalmology and Anatomy and Neurobiology.)

Charles E. Molnar, B.S.E.E., Rutgers University, 1956; M.S.E.E., 1957; Sc.D., Massachusetts Institute of Technology, 1966. (Also Computer Systems Laboratory.)

Alan L. Pearlman, A.B., State University of Iowa, 1958; M.D., Washington University, 1961. (See Department of Neurology and Neurological Surgery.)

Carl M. Rovainen, B.S., California Institute of Technology, 1962; Ph.D., Harvard University, 1967.

Michael P. Sheetz, B.A., Albion College, 1968; Ph.D., California Institute of Technology, 1972.

Thomas A. Woolsey, B.S., University of Wisconsin, 1965; M.D., Johns Hopkins University, 1969. (See Departments of Anatomy and Neurobiology and Neurology and Neurological Surgery.)

Associate Professors

Leonard J. Banaszak, B.S., University of Wisconsin, 1955; M.S., Loyola University, 1960; Ph.D., 1961. (See Department of Biological Chemistry.)

Harold Burton, B.A., University of Michigan, 1964; Ph.D., University of Wisconsin, 1968. (See Department of Anatomy and Neurobiology.)

E. Sessions Cole, B.A., Amherst College, 1969; M.D., Yale University School of Medicine, 1973. (See Department of Pediatrics.)

Yasushi Fukami, M.D., Kyoto University, 1957; Ph.D., 1961.

Robert P. Mecham, B.S., University of Utah, 1973; Ph.D., Boston University, 1976. (See Department of Medicine.)

Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Department of Anesthesiology and Biomedical Computer Laboratory.)

Assistant Professors

Stephen L. Gluck, B.S., Yale College, 1973; M.D., University of California-Los Angeles, 1977. (See Department of Medicine.)

Edwin W. McCleskey, B.A., University of California, Berkeley, 1976; Ph.D., University of Washington, Seattle, 1983.

Robert W. Mercer, B.A., San Jose State University, 1974; Ph.D., Syracuse University, 1980.

Stanley Misler, B.S., City College of the City University of New York, 1970; M.D., New York University School of Medicine, 1977; Ph.D., New York University, 1977. (See Department of Medicine.)

Mike Max Mueckler, B.A., University of Wisconsin-Madison, 1976; Ph.D., 1982.

David H. Perlmutter, B.A., University of Rochester, 1974; M.D., St. Louis University School of Medicine, 1978. (See Department of Pediatrics.)

Louis Simchowicz, B.S., The City College of New York, 1966; M.D., New York University School of Medicine, 1970. (See Department of Medicine.)

Research Assistant Professors

David Parkinson, B.Sc., University of Bath, 1976; Ph.D., Cambridge University, 1979.

Thomas E. Wileman, B.Pharm., University of London, 1976; Ph.D., Liverpool Polytechnic, 1980.

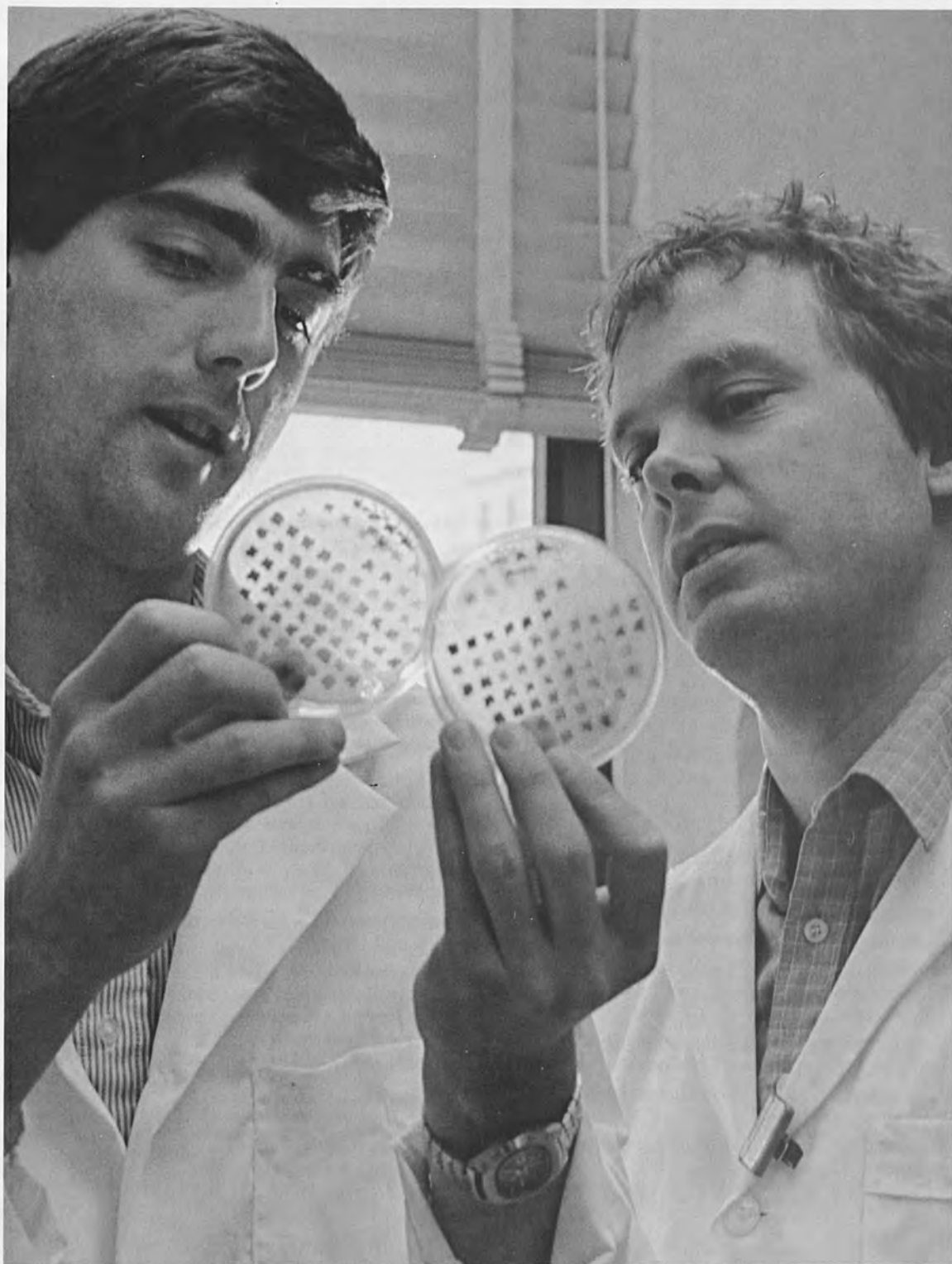
Robert S. Wilkinson, B.S., Rice University, 1968; M.A., University of Texas, Austin, 1970; Ph.D., 1974.

Instructor

Shirley A. Sahrman, B.S.P.T., Washington University, 1958; A.M., 1971; Ph.D., 1973. (See Departments of Neurology and Neurological Surgery and Program in Physical Therapy.)

**JAMES S.
McDONNELL**

**DEPARTMENT OF
GENETICS**



GENETICS

The McDonnell Department of Genetics provides a broad program of preclinical and graduate instruction in genetics, with research opportunities ranging from cell and molecular genetics to population genetics and genetic epidemiology. A medical genetics course offered in the third trimester of the first year provides a thorough introduction to human and clinical genetics. Advanced training in clinical genetics is available in the fourth year of study through the Division of Medical Genetics of the Departments of Medicine and Pediatrics.

Virtually all major areas of investigation in modern genetics are represented in the McDonnell Department of Genetics, and a broad range of research and graduate training opportunities is available. Advanced courses and seminars are offered in the areas of human genetics, molecular genetics, developmental genetics, gene expression, microbial genetics, immunogenetics, and population genetics. Extraordinary opportunities for research training and experience are available at all levels.

FIRST YEAR

Bio 550. Medical Genetics

Lectures and clinical conferences on human and medical genetics, including such subjects as clinical cytogenetics, molecular genetics, inborn errors of metabolism, genetic counseling, immunogenetics, population genetics, and genetic epidemiology. Lectures and clinical conferences only. Credit 2 units. Prerequisite, an introductory genetics course or permission of the instructor. Students may also qualify by attending several review lectures in genetics, which are given at the beginning of the first year. *Dr. Levine*

RESEARCH

Bio 590. Research Opportunities

Mechanisms of gene transposition and plasmid-host cell interactions. *Dr. Berg*

Neuroblastoma and oncogene activation. *Dr. Brodeur*

Genetics of psychiatric disorders. *Dr. Cloninger*

Molecular-genetic relationships of products of the major histocompatibility gene complexes. *Dr. Cullen*

Developmental genetics of *Drosophila*. *Dr. Duncan*

Molecular population genetics and evolution in bacteria. *Dr. Dykhuizen*

Human restriction fragment length polymorphisms as chromosome markers. *Dr. Gerhard*

Cellular immunology and the role of major histocompatibility gene products. *Dr. Hansen*

Experimental population genetics and molecular evolution. *Dr. Hartl*

Genetic disorders in amino acid metabolism. *Dr. Hillman*

Molecular population genetics. *Dr. Johnson*

Gene expression in yeast. *Dr. Johnston*

Chemical properties and molecular structure of complement proteins. *Dr. Levine*

Molecular organization of eukaryotic chromosomes. *Dr. Olson*

Human population genetics and genetic epidemiology. *Dr. Rao*

Genetics of psychiatric disease. *Dr. Reich*

Theoretical population genetics. *Dr. Sawyer*

Molecular population genetics and life history in plant populations. *Dr. Schaal*

Immunogenetics and molecular genetics of the major histocompatibility gene complexes. *Dr. Shreffler*

Human population and anthropological genetics. *Dr. Suarez*

Population and developmental genetics in *Drosophila*. *Dr. Templeton*

Genetics of muscle development and nonsense suppressors in the nematode, *C. elegans*. *Dr. Waterston*

Molecular and population genetics of alcohol metabolism. *Dr. Yokoyama*

ELECTIVES

Bio 5244. Topics in Gene Expression.

Review and critical discussion of current research articles related to gene regulation, particularly in eukaryotes. *Dr. Waterston, Staff*

Bio 5271. Immunogenetics.

Genetic and immunologic aspects of the major histocompatibility complex. *Drs. Shreffler, Hansen*

Bio 5281. Developmental Genetics.

Genetics of developmental events, including sex determination, pattern formation, cell fate, and regulation of tissue specific genes. Emphasis will be placed on the use of genetics to investigate these phenomena in organisms such as yeast, *C. elegans*, *Drosophila*, and mouse. *Dr. Waterston*

Bio 548. Nucleic Acids & Protein Biosynthesis

This course will cover fundamental aspects of the structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis will be placed on mechanisms involved in the biosynthetic processes and the regulation thereof. *Dr. Johnston*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological problems. Examples drawn from bacteria, maize, yeast, nematodes and fruit flies.

Drs. Waterston, Johnston

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.



Faculty

James S. McDonnell Professor of Genetics and Head of Department
Daniel L. Hartl, B.S., University of Wisconsin, 1965; Ph.D., 1968. (Also Faculty of Arts and Sciences.)

Professors

Douglas E. Berg, B.S., Cornell University, 1964; Ph.D., University of Washington, 1969. (See Department of Microbiology and Immunology.)

C. Robert Cloninger, B.A., University of Texas, 1966; M.D., Washington University, 1970; M.D. (hon.), Umea University Sweden, 1983. (See Department of Psychiatry.)

Susan E. Cullen, B.S., College of Mount St. Vincent, 1965; Ph.D., Albert Einstein College, 1971. (See Department of Microbiology and Immunology.)

Richard E. Hillman, A.B., Brown University, 1962; M.D., Yale University, 1965.

George B. Johnson, B.A., Dartmouth College, 1964; M.A., 1966; Ph.D., Stanford University, 1972. (Also Faculty of Arts and Sciences.)

R. Paul Levine, A.B., University of California, Los Angeles, 1949; Ph.D., 1951.

Maynard V. Olson, B.S., California Institute of Technology, 1965; Ph.D., Stanford University, 1970.

Dabeeru C. Rao, B.S., Indian Statistical Institute, 1967; M.S., 1968; Ph.D., 1971. (See Department of Psychiatry and Division of Biostatistics.)

Theodore Reich, B.S., McGill University, 1959; M.D., 1963. (See Department of Psychiatry.)

Stanley Sawyer, B.S., California Institute of Technology, 1960; Ph.D., 1964. (See Division of Biostatistics.) (Also Faculty of Arts and Sciences.)

Donald C. Shreffler, B.S., University of Illinois, 1954; M.S., 1958; Ph.D., California Institute of Technology, 1962.

Alan R. Templeton, A.B., Washington University, 1969; M.A., University of Michigan, 1972; Ph.D., 1972. (Also Faculty of Arts and Sciences.)

Robert H. Waterston, B.S.E., Princeton University, 1965; M.D., University of Chicago, 1972; Ph.D., 1972. (See Department of Anatomy and Neurobiology.)

Associate Professors

James P. Crane, A.B., Indiana University, 1966; M.D., 1970. (See Department of Obstetrics and Gynecology.)

Ted H. Hansen, B.S., Michigan State University, 1970; M.S., University of Michigan, 1972; Ph.D., 1975.

Barbara A. Schaal, B.S., University of Illinois, 1969; M.Phil., Yale University, 1971; Ph.D., 1974. (Also Faculty of Arts and Sciences.)

Brian K. Suarez, B.A., San Fernando Valley State College, 1967; M.A., University of California, Los Angeles, 1972; Ph.D., 1974. (See Department of Psychiatry.)

Research Associate Professor

Daniel E. Dykhuizen, B.S., Stanford University, 1965; Ph.D., University of Chicago, 1971.

Assistant Professors

Garrett M. Brodeur, B.A., St. Louis University, 1971; M.D., Washington University, 1975. (See Department of Pediatrics.)

S. Bruce Dowton, B.M., B.S., University of New South Wales, 1980. (See Department of Pediatrics.)

Ian W. Duncan, B.Sc., University of British Columbia, 1974; Ph.D., University of Washington, 1978. (Also Faculty of Arts and Sciences.)

Daniela S. Gerhard, B.A., Barnard College, 1976; Ph.D., Cornell University, 1982.

H. Mark Johnston, B.A., University of Wisconsin, 1974; Ph.D., University of California, Berkeley, 1980.

Timothy J. Ley, B.A., Drake University, 1974; M.D., Washington University, 1978. (See Department of Medicine.)

Peter S. Rotwein, B.A., Yale College, 1971; M.D., Albert Einstein College of Medicine, 1975. (See Department of Medicine.)

Lawrence B. Salkoff, B.A., University of California, Los Angeles, 1967; Ph.D., University of California, Berkeley, 1979. (See Department of Anatomy and Neurobiology.)

Michael S. Watson, B.S., American University, 1974; M.S., University of Alabama, 1977; Ph.D., 1981. (See Department of Pediatrics.)

Research Assistant Professors

Miroslav Hauptfeld, M.D., University of Zagreb, 1963.

Vera Hauptfeld, Ph.D., Charles University, 1968.

David R. Lee, B.A., University of California, Santa Barbara, 1975; Ph.D., University of Virginia, 1980.

Donald G. Moerman, B.Sc., Simon Fraser University, 1973; Ph.D., 1980.

JOHN MILLIKEN
DEPARTMENT OF
MEDICINE



MEDICINE

The general medicine teaching services of the department are located at Barnes Hospital, Jewish Hospital, and Veterans Hospital (John Cochran Division) under the following directors:

Barnes Hospital, *Dr. Kipnis*

House Staff Training Program, *Dr. Hammerman*

Jewish Hospital, *Dr. Peck*

House Staff Training Program, *Dr. Lefrak*

Veterans Hospital, *Dr. Chase*

In addition, for the purposes of both teaching and research, the Department of Medicine is divided into specialty divisions at Barnes Hospital and Jewish Hospital under the following directors:

Bone and Mineral Diseases, *Dr. Avioli*

Cardiovascular Diseases, *Drs. Sobel, Lange*

Dermatology, *Dr. Eisen*

Endocrinology and Metabolism, *Drs. Cryer, Schonfeld*

Gastroenterology, *Drs. Alpers, Stenson*

Hematology-Oncology, *Drs. Majerus, S. Kornfeld, T. Deuel*

Immunology and Allergy Diseases, *Dr. Lob*

Infectious Diseases, *Drs. Medoff, Little*

Laboratory Medicine, *Dr. J. M. McDonald*

Renal Diseases, *Drs. Klahr, Hruska*

Respiratory and Critical Care Division, *Drs. J. A. McDonald, Senior*

Rheumatology, *Dr. Atkinson*

Instruction in Medicine is provided during all four years of the medical curriculum, beginning with human genetics and an introductory course in the first year. Teaching in the second year has two main objectives: the correlation of the basic sciences with clinical aspects of disease and training in the technical methods of physical examination and laboratory diagnosis. By the beginning of the third year, the student is prepared for supervised clinical study of individual patients. A clinical clerkship of 12 weeks, divided into two six-week periods, is served by third-year students on one of the medical services supervised by the department. In the final year, students may elect a subinternship in general medicine or select any of a series of elective courses offered in the various medical subspecialties.

FIRST YEAR

Topics in Clinical Medicine

This interdepartmental course is designed to stimulate student interest in clinical medicine through carefully selected and presented discussions of both the clinical and basic science features of a number of illnesses.

The course director involves faculty from the several clinical departments in structuring the direction, content, and presentation of the subject. *Dr. Kipnis and Staff*

SECOND YEAR

Teaching by the Department of Medicine is designed to (1) prepare students for the transition from the pre-clinical sciences to the study of the sick patient at the bedside, (2) help them analyze the manifestations of disease in terms of the altered mechanisms responsible for these manifestations, and (3) introduce them to the techniques of examination which are used regularly on all clinical services with the beginning of the third-year clerkships. This instruction is at times undertaken jointly with members of other clinical departments, and is coordinated when practicable with subject matter presented by the Department of Pathology.

Pathophysiology

Selected topics in clinical medicine are discussed in detail to illustrate the application of biochemical, physiological, and anatomical information in the understanding of pathological states. Cardiovascular and renal, neurological, gastrointestinal, hematological, metabolic, nutritional, and developmental diseases are reviewed by an interdepartmental faculty. Emphasis is placed on the use of fundamental information in approaching clinical problems as a way of thinking in preparation for a lifetime of medicine, during which much new information will constantly be acquired.

Department of Medicine Staff

Preparation for Clinical Medicine

PCM is a multidisciplinary, clinical data collection and problem solving course designed to prepare students for meaningful participation in third year clinical activities as a member of the health care team. Centrally coordinated, the clinical aspects of Human Sexuality, Psychiatry, Pediatrics, Surgery, Ophthalmology, Otolaryngology, Obstetrics, Gynecology, Radiology, Neurology, and Medical Sociology are integrated to aid the students' development of skills in the physician-patient relationships, clinical data collection and problem solving. A variety of instructional formats are used including lecture, demonstration, film and video tape, supervised peer examination (supervised sessions where students perform portions of the physical exam on each other), evaluation of clinical subjects simulating patient care situations, and computer assisted instruction as well as supervised interaction with patients in both the ambulatory and hospital setting. Data collection, data processing, and problem solving are the desired skills; a view that the patient is a social being interacting with illness, family, environment, and physician is the desired attitude.

During the 269 hours of instruction, the mean student-faculty ratio is less than 6:1.

Dr. Tuteur and Staff

THIRD YEAR

General Medicine

Supervised study of patients on the medical nursing divisions of Barnes Hospital (both Blue and Red), Jewish Hospital, and St. Louis Veterans Administration



Hospital. Students are assigned in rotation as clinical clerks to the patients admitted to these services. Teaching is provided by attending physicians, house officers, consultants, and at regularly scheduled conferences. Formal instruction will be given in medical therapeutics during the clerkship. Students serve for six weeks on two of the five services. *Drs. Chase, Kipnis, Peck, and Staff*

Clinical Pathological Conference

Abstracts of the clinical records of patients upon whom postmortem examinations have been performed are presented in advance to members of the third- and fourth-year classes and to members of the medical staff. At each conference the diagnosis is discussed in detail by the clinical staff before the anatomical findings are presented by the pathologists.

Dr. Kipnis and Medical Staff, Dr. Kissane and Pathology Staff

FOURTH YEAR ELECTIVES

Medical Subinternship

Medical subinternships, in multiples of six weeks, are offered to a limited number of students on the following medical services: Barnes Hospital Blue Service, Jewish Hospital and St. Louis Veterans Administration Hospital. Duties and responsibilities, including nights on call, will be those of an intern, with the proviso that requirements of Missouri state law must be met (e.g., orders must be countersigned by a licensed physician, etc.). The workload will be lighter than that for interns to insure ample time for reading about patients. Instruction and supervision will be provided by the appropriate chief of service, attending physicians, consultants, and house officers. Attendance at scheduled teaching conferences is required. The subinternship should be especially valuable to students who plan to take straight medical internships and to those

who plan to go directly into a specialty residency program without first serving an internship of any kind (e.g., neurology, psychiatry, etc.). *Drs. Chase, Kipnis, Peck, and Staff*

Clinical Pathological Conference

Thursday, 12-1 p.m., September to June.

Dr. Kipnis and Medical Staff,

Dr. Kissane and Pathology Staff

Arthritic and Rheumatic Diseases

(A) Clinical Rheumatology. Barnes, Jewish, and VA, six weeks, all day. Students will participate in consultative service and clinic and inpatient practices. Laboratory experience also available. *Dr. Atkinson and Staff*

(B) Research.

1. Studies related to complement deficiency states and immunogenetics of complement proteins in humans and animals and biosynthesis, genetics and structure-function relationships of complement receptors and complement regulatory proteins. *Dr. Atkinson*

2. Structure of the human major histocompatibility complex (HLA) antigens. Mechanisms of HLA and disease association. *Dr. Schwartz*

3. Students participate in research procedures which include quantitation of the cell functions of chemotaxis, phagocytosis, and lysosomal enzyme release, isolation of cell receptors for chemotactic factors and purification of enzymes involved in neutrophil activation. *Dr. Spilberg*

Cardiovascular Disease

(A) Clinical Cardiology. Barnes Hospital, six weeks, all day. Students will participate as members of Cardiovascular Division clinical service, on the Cardiology Consultation team and in the Cardiac Diagnostic Laboratory. Particular emphasis will be placed on clinical diagnosis, electrocardiography and the non-invasive techniques. *Dr. Geltman and Staff*

(B) Clinical Cardiology. St. Luke's Hospital West, six weeks, all day. Students are assigned to Cardiology Division in the cardiology intensive care unit, heart station, echo laboratory, nuclear cardiology laboratory, and catheterization laboratory. *Drs. R. Paine, G. Clark, S. Brodarick, D. Bauwens, and S. Gowda*

(C) Clinical Cardiology. Jewish Hospital, six weeks, all day. Students have experience in seeing patients on the cardiology consult service and cardiac catheterization service, reading electrocardiograms, and participating in activities of the Coronary Care Unit. In addition, students may observe procedures in the cardiac catheterization laboratory. *Drs. Lange, Kleiger, Krone, and Staff*

(D) Cardiac Catheterization and Hemodynamics. Highly specialized elective. Four weeks. Students will attend cardiac catheterization procedures and conferences; will perform complete "workups" of patients in preparation for catheterization, etc.; and will observe all hemodynamic and angiographic procedures. *Dr. Ludbrook and Staff*

(E) Electrocardiography. Jewish Hospital. Course designed to give the student familiarity with concepts involved in the interpretation of electrocardiography.

Dr. Ruffy

(F) Cardiac Arrhythmias and Clinical Electrophysiology. Jewish Hospital. Provides the student with exposure and teaching in the diagnosis and treatment of complex rhythm disturbances. *Dr. Ruffy*

(G) Cardiology/CCU. Jewish Hospital. Students will be introduced to cardiac graphics, electrocardiography, echocardiograms, and other non-invasive tests, then rotate through CCU as a subintern. Students are expected to perform initial evaluation and formulate management plan under resident's guidance, make brief oral presentations to CCU attendings. Night call every third night. *Dr. M. Rich*

(H) Research. Minimum of 12 weeks, all day.

1. Characterization of myocardial blood flow and metabolism during ischemia and reperfusion.

Dr. S. Bergmann

2. Ultrasonic characterization of atherosclerotic plaque. Non-invasive detection in changes in atherosclerotic plaque over time. *Dr. Barzilai*

3. Characterization of biochemical changes responsible for post-translational modification of MM and MB creatine kinase into isoforms. *Dr. Billadello*

4. Delineation of mechanisms responsible for clinical arrhythmias, identification of patients at risk for developing sudden cardiac death, evaluation of antiarrhythmic agents and pacing devices. *Dr. Cain*

5. Delineation of biochemical and electrophysiologic mechanisms responsible for arrhythmogenesis.

Dr. Corr

6. (a) Clinical Elective: Performance and interpretation of exercise training measurement of oxygen uptake and cardiac output. Management of patients undergoing exercise training. (b) Research Elective: Physiology adaptations to exercise training in ischemic heart disease and effect of exercise training on age-related deterioration in cardiovascular function. *Dr. Ehsani*

7. Investigation of basic mechanisms of atherogenesis and cardiomyopathy. Focus is on vascular intracellular metabolism of cholesterol regulation of enzymes. Jewish Hospital. *Dr. Lange*

8. Hemodynamics, myocardial mechanics, and ventricular function (cardiac catheterization). *Dr. Ludbrook*

9. Ultrasonic assessment of cardiac metabolism. *Dr. Perez*

10. Detection, quantification, and assessment of the mediation of myocardial ischemic injury. *Dr. Sobel*

Dermatology

(A) Clinical Clerkship. Students participate in both inpatient and outpatient care. Stress is placed on the dermatologic variations normally encountered, identification of common skin diseases, dermatologic clues to systemic disease, etc. Instruction is given in cutaneous histopathology and clinical mycology.

Dr. Eisen and Staff



(B) Research. Minimum of 12 weeks, all day.

1. Biochemistry and regulation of mammalian connective tissue degradation. *Drs. Bauer, Eisen, Goldberg, Jeffrey, and Seltzer*

2. Origins of DNA replication in mammalian cells. *Dr. G. Goldberg*

3. Biochemical studies on the control of cellular differentiation of the medically important systemic mycotic agents in particular *Histoplasma capsulatum*. *Dr. Kobayashi*

Gastroenterology

(A) Clinical Gastroenterology. Four weeks, all day. Students participate in the study of patients with a spectrum of digestive diseases, have responsibility for patients on whom consultations have been requested, observe biopsy, endoscopic and intubation techniques, and participate in the conferences and clinics run by the Division. *Dr. Zuckerman*

(B) Research. Minimum of 12 weeks, all day.

1. Synthesis and processing of intestinal proteins; regulation by dietary and hormonal factors *in vivo* and in cultured intestinal cells. Emphasis will be on brush border enzymes and cobalamin binding proteins. *Dr. Alpers*

2. Stimulus-secretion coupling in colonic epithelial cells. Focus on role of protein phosphorylation in control of ion transport. *Dr. Cohn*

3. Research on lymphocyte function in human disease. *Dr. R. MacDermott*

4. Clinically applied research on viral hepatitis. Emphasis on applying current immunological methodology. *Dr. Perrillo*

5. Human cellular immunology. *Dr. Peters*

6. Functional organization of brush border membrane. *Dr. Seetharam*

General Internal Medicine

Clerkship in Primary Care in General Internal Medicine is designed to provide the student with firsthand experience in general internal medicine practice in a model ambulatory care setting, the Medical Care Group of St. Louis (MCG). The major component of the clerkship is direct patient care under the supervision of senior internists who are members of the group. *Dr. Rice and Staff*

Geriatric Medicine

Clinical Geriatrics. Six weeks, all day. Students will make rounds at a nursing facility, participate in a clinic and outpatient assessment clinic. Attendance at research and clinical conferences and teaching rounds in geriatric medicine required. *Drs. Peck, Birge, Davis, and Staff*

Hematology and Oncology

(A) Clinical Hematology and Oncology. Six weeks, all day. Students receive intensive instruction in morphology, specialized diagnostic techniques, and management of patients with hematologic and oncologic disorders. Two separate clerkships are offered. *Drs. S. Kornfeld, Majerus*

(B) Clinical Hematology/Oncology. Barnes Hospital. Six weeks, all day. Activities include the work-up, evaluation, and treatment primarily of inpatients undergoing experimental chemotherapy for hematologic malignancy and selected solid tumors. Emphasis is placed on attempts to develop curative therapy utilizing bone marrow transplantation. *Drs. G. Herzog, Marion, and Safdar*

(C) Clinical Oncology. Cochran VA Hospital. Six weeks, all day. Students receive major exposure to management of non-small cell and small cell lung cancer and of carcinoma of the colon, prostate, head, and neck. General oncological topics such as pain management, hypercalcemia of malignancy, malignant effusions, and neurooncology will be treated. *Drs. Abbey, Hickman*

(D) Clinical Hematology/Medical Oncology Consultation Service. Jewish Hospital. Six weeks, all day. Students will participate on inpatient consultation service, but equal emphasis will be given to the care of outpatients with cancer and hematologic disease. Specialized training will be provided at the Marilyn Fixman Breast Center and Lymphoma Consultation Service. Emphasis on principles of cancer management and supportive, palliative treatment of patients. *Dr. A. Lyss*

(E) Research. Minimum of 12 weeks, all day.
1. Biochemistry and mechanisms of action of the platelet-derived growth factor (PDGF). *Dr. T. Deuel*
2. Biochemistry of mammalian cell membranes. *Drs. R. Kornfeld, S. Kornfeld*

3. Biochemistry of platelets, regulation of lipid metabolism in tissue culture; mechanism of platelet thrombus formation. *Dr. Majerus*

4. Molecular biology of hormonally regulated genes; characterization of the thial protease gene family. *Dr. Rogers*

5. Biochemical studies of interactions of plasma protease inhibitors with coagulation protease. *Dr. Tollefsen*

Hypertension

Research. Individualized research project and/or participation in a community hypertension program. *Dr. Perry*

Immunology

(A) Allergy and Clinical Immunology. Students will participate in the allergy consult service at Barnes and Jewish Hospitals. They will be primary consult on a team with an allergy fellow. In addition, they will participate in other on-going teaching activities in the division. *Dr. H. J. Wedner and Staff*

(B) Research. Minimum of 12 weeks, full-time.

1. Molecular biology of antigen specific T-cell receptor. *Dr. D. Lob*

2. Molecular biology of IL-1, steroid 25-hydroxylase and complement genes. *Dr. D. Chaplin*

3. Biochemistry and molecular biology of molecules important in immediate hypersensitivity. *Dr. C. Parker*

4. Protein phosphorylation in activated T-cells. *Dr. H. J. Wedner*

5. Bovine IGG and human immunologic responses and disease. *Dr. A. Kulczycki*

Infectious Disease

(A) Clinical Infectious Diseases. Study of patients Barnes Hospital, six weeks, all day. *Dr. Medoff*

(B) Research.

1. The molecular biology of varicella-zoster virus. Varicella-zoster virus infection, latency, and oncogenicity. *Dr. Gelb*

2. Research. Minimum of 12 weeks, all day. The biology of mouse macrophage clones in culture: monokine secretion, cell activation, antigen presentation. *Dr. Little*

3. Effective therapy for fungal infections, control of membrane permeability of fungi, normal and transformed animal cells, alteration and control of immunologic response to infection and tumors, drug studies on bacterial pathogens. *Dr. Medoff*

Laboratory Medicine

(A) Clinical Laboratory Medicine. Elective is designed to teach the student how the vast array of clinical assays are used in the diagnosis of disease and how the tests are actually performed in the clinical laboratory. *Dr. McDonald*

(B) Research.

1. Studies on the control of cellular differentiation of the medically important systemic mycotic agents in particular *Histoplasma capsulatum*. Dr. Kobayashi
2. Drug action and resistance in *Plasmodium falciparum*, red cell deformability and parasite growth, epidemiology of nosocomial infection. Dr. Krogstad
3. Development and use of monoclonal antibodies to isoenzymes. Dr. Ladenson
4. Study of changes in pattern of gene expression in mammalian nervous system; specific focus on the tropic hormone and nerve growth factor. Dr. Milbrandt
5. Research focuses upon the cellular mechanism of insulin action and the intracellular mechanism of Ca^{2+} homeostasis and the role of intracellular Ca^{2+} , calmodulin and protein kinase C in metabolic regulation. Dr. McDonald
6. Study of restriction of IgG subclasses expression and B lymphocyte subpopulation within germinal center. Dr. Nabm
7. Analytical techniques and theoretical concepts underlying the field of medical decision analysis are investigated. Dr. Parvin
8. Research elective designed to familiarize student with fundamental concepts and techniques of histocompatibility and transplantation immunology. Special emphasis of the laboratory is transplantation immunology and the regulation of immune responses following alloimmunization. Dr. Rodey
9. Research is aimed at defining the mechanisms of cell-cell and cell-substrate adhesion as manifest by the blood platelet. Dr. Santoro

Metabolism and Endocrinology

- (A) Clinical Clerkship. Students see inpatients and outpatients with endocrine and metabolic disease and participate in the rounds and conferences of the Metabolism Division. Drs. Cryer, Daughaday and Staff
- (B) Bone and Mineral Metabolism. Jewish Hospital. Designed to acquaint students with clinical, radiological, and pathological manifestations of generalized disorders of endocrinology and of the skeleton and to expose them to current concepts of therapy. Drs. Avioli, S. Birge, Chase, and Whyte
- (C) Research. Minimum of 12 weeks, all day.
1. Research activities involve analysis of age-related changes on membrane-transport activities, alterations in cellular metabolism, calcium control and energy utilization. Dr. Avioli
 2. Studies of the physiology and pathophysiology of metabolic regulation in normal humans and patients with diabetes mellitus. Dr. Cryer

3. Pituitary physiology; growth hormone, prolactin. Dr. Daughaday
4. Regulation of plasma and body cholesterol levels studied in patients with atherosclerosis and hyperlipidemia. Lipoprotein receptor structure, function and modification is investigated in normal and mutant cultured human cells. Dr. Ostlund
5. Studies of genetic susceptibility to diabetes in man and experimental animal models through recombinant DNA techniques. Dr. Permutt

Pharmacology/Medicine

Role of endogenous eicosanoids on cellular transport and renal vascular tissue. Phospholipid and complex lipid metabolism in relation to renal injury. Role of inositol phospholipids in renal cell function. Dr. Morrison

Pulmonary Disease and Function

- (A) Medical Aspects of Pulmonary Disease. A full-time elective, periods one through eight. Elective offered at both Barnes and Cochran VA. Hospital. Drs. C. Daughaday, McDonald, Pierce, Tuteur, and Staff
- (B) Pulmonary Medicine. Six weeks. Students will work up patients and participate in teaching conferences and work rounds. Jewish Hospital. Drs. Senior, Lefrak, and Staff
- (C) Medical/Respiratory Intensive Care (4 weeks). Offered as an opportunity to gain additional experience in acute, primary care medicine. Students considering this elective will be expected to have already completed their Medicine Subinternship. Dr. Schuster
- (D) Intensive Care Medicine (4 weeks). Patient care responsibility, night call, conferences and attending rounds. Medical Intensive Care Unit at Jewish Hospital. Dr. Lefrak

(E) Research electives.

1. Students will be introduced to contemporary methods to study the interaction of cells with extracellular matrix molecules important in wound healing and repair and embryogenesis. Dr. McDonald
2. Positron emission tomographic studies of acute lung injury. Students will be introduced to large animal models of acute lung injury and techniques involving positron emission tomography, nuclear medicine and pulmonary physiology. Dr. Schuster

Renal Disease

- (A) Clinical Nephrology. Barnes Hospital, six weeks, all day. Study of patients with renal disease and electrolyte disorders. Drs. Klabr, Slatopolsky, and Staff
- (B) Clinical Nephrology. Jewish Hospital. Students will be provided opportunity to evaluate patients on the renal consultant service, participate in daily clinical nephrology rounds, and participate in combined rounds. Dr. Hruska

(C) Mixed clinical and research electives.

1. Clinical and metabolic studies in patients with end stage renal disease and hemodialysis patients.

Dr. Delmez

2. Studies on physiology of isolated renal tubular segments with an emphasis on acid-base metabolism and influence of pH on transport. *Dr. Lee Hamm*

3. Studies of solute transport in isolated membrane vesicles from renal tubular cells. Studies of protein phosphorylation through the activity of membrane bound protein kinase. *Dr. Hammerman*

4. Cellular mechanisms of parathyroid hormone action. Renal phospholipid metabolism and effects of parathyroid hormone. *Dr. Hruska*

5. Mechanisms involved in progression of renal disease. Methodology to assess renal function and prevent progression of renal disease in experimental animal models. *Dr. Klabr*

6. Studies on the metabolism of parathyroid hormone by isolated adult perfused bone. Studies on parathyroid hormone receptors in kidney membranes with emphasis on their function in diseased states.

Dr. K. Martin

7. Mechanisms of modulation of neuromuscular transmission by cations, repetitive stimulation, neurotoxins, osmotic pressure and regulatory neuropeptides.

Dr. Misler

8. Studies on the biochemical control of parathyroid hormone biosynthesis, intracellular processing and secretion. *Dr. Morrissey*

9. Structural-functional correlations in renal disease. Studies on the pathophysiology of acute and chronic renal failure. *Dr. Purkerson*

10. Radioimmunoassay for parathyroid hormone. Role of the liver in the metabolism of parathyroid hormone. Studies investigate interrelationships between vitamin D metabolites and parathyroid metabolism.

Dr. Slatopolsky

11. Immunopathology of renal diseases: Role of macrophage in renal disease. *Dr. Schreiner*

Section of Applied Physiology

(A) Clinical Elective. Exercise in Medicine and Preventive Medicine. Six weeks, all day. Students will participate as members of Applied Physiology Section's clinical team, doing exercise-testing, with measurement of oxygen uptake and cardiac output, and metabolic studies; and working with patients with coronary artery disease, diabetes, and/or hypertension who are undergoing exercise-training as part of their treatment. *Drs. Dalsky, Ehsani, Holloszy, W. Martin, Staten*

(B) Research Elective. Physiology and Biochemistry of Exercise. Research deals with the acute and chronic responses to exercise. Areas include biochemical adaptation in muscle in response to endurance exercise; cardiac adaptations to increased work load; the serum triglyceride lowering effect of exercise; the biochemical basis of muscle fatigue and the insulin-like effect of exercise. *Drs. Holloszy, Ehsani, and Dalsky*

Faculty

Adolphus Busch Professor and Chairman of Department

David M. Kipnis, A.B., Johns Hopkins University, 1945; M.A., 1949; M.D., University of Maryland, 1951.

John E. and Adaline Simon Professor and Associate Chairman of Department

William A. Peck, A.B., Harvard University, 1955; M.D., University of Rochester, 1960.

Professors Emeriti

Carl G. Harford, A.B., Amherst College, 1928; M.D., Washington University, 1933.

Virginia Minnich, B.S., Ohio State University, 1937; M.S., Iowa State College, 1938.

Edward H. Reinhard, A.B., Washington University, 1935; M.D., 1939. (See Department of Radiology.)

Robert E. Shank, A.B., Westminster College, 1935; M.D., Washington University, 1939.

Professors

David H. Alpers, A.B., Harvard University, 1956; M.D., 1960.

John P. Atkinson (Howard Hughes Medical Institute Investigator in Medicine), A.B., University of Kansas, 1965; M.D., 1969. (See Department of Microbiology and Immunology.)

Sydney M. and Stella H. Shoenberg Professor

Louis V. Avioli, B.A., Princeton University, 1953; M.D., Yale University, 1957.

Clifton A. Baile (Adjunct Professor of Nutrition in Medicine), B.S., Central Missouri State College, 1962; Ph.D., University of Missouri, 1965.

Eugene A. Bauer (Dermatology), B.S., Northwestern University, 1963; M.D., 1967.

John Pope Boineau, B.S., University of South Carolina, 1955; M.D., Duke University, 1959. (See Department of Surgery.)

Elmer B. Brown, Jr., A.B., Oberlin College, 1946; M.D., Washington University, 1950. (See Administration.)

Hugh Chaplin, Jr., A.B., Princeton University, 1943; M.D., Columbia University, 1947. (See Department of Pathology.)

Lewis R. Chase, A.B., Princeton University, 1960; M.D., Harvard University, 1964. (Chief, Washington University Medical Services, Cochran VA Hospital.)

Philip E. Cryer, B.A., Northwestern University, 1962; M.D., 1965. (Also Clinical Research Center.)

William H. Danforth, A.B., Princeton University, 1947; M.D., Harvard University, 1951. (See Administration.)

Irene E. and Michael M. Karl
Professor of Endocrinology and Metabolism

William H. Daughaday, A.B.,
Harvard University, 1940; M.D.,
1943.

Lewis T. and Rosalind B. Apple
Professor of Oncology in Medicine

Thomas F. Deuel, A.B., Princeton
University, 1957; M.D., Columbia
University, 1961. (See Department
of Biological Chemistry.)

The Winfred A. and Emma R.
Shouman Professor of Dermatology

Arthur Z. Eisen (Dermatology),
A.B., University of Buffalo, 1951;
Sc.M., Brown University, 1953;
M.D., University of Pennsylvania,
1957.

John O. Holloszy, M.D., Washington
University, 1957.

Keith A. Hruska, B.S., Creighton
University, 1965; M.D., 1969.

John J. Jeffrey, Jr. (Dermatology),
B.S., College of the Holy Cross,
1958; Ph.D., Georgetown
University, 1965. (See Department
of Biological Chemistry.)

M. Kenton King, B.A., University of
Oklahoma, 1947; M.D., Vanderbilt
University, 1951. (See
Administration.)

Joseph Friedman Professor of Renal Diseases in Medicine

Saulo Klahr, B.S., College of Santa
Librada, 1954; M.D., Universidad
Nacional de Colombia, 1959.

Robert E. Kleiger, B.A., Yale
University, 1956; M.D., Harvard
University, 1960.

Jossephe Kleinman (Visiting), M.D.,
Hadassah University, Jerusalem,
1973.

George S. Kobayashi
(Microbiology), B.S., University of
California, 1952; Ph.D., Tulane
University, 1963. (See Department
of Microbiology and Immunology.)
Rosalind H. Kornfeld, B.S., George
Washington University, 1957; Ph.D.,
Washington University, 1961. (See
Department of Biological
Chemistry.)

Stuart A. Kornfeld, A.B., Dartmouth
College, 1958; M.D., Washington
University, 1962. (See Department
of Biological Chemistry.)

Jack H. Ladenson (Clinical
Chemistry), B.S., Pennsylvania
State University, 1964; Ph.D.,
University of Maryland, 1971. (See
Department of Pathology.)

Stephen S. Lefrak, A.B., Colgate
University, 1960; M.D., State
University of New York, Downstate,
1965.

J. Russell Little, Jr., A.B., Cornell
University, 1952; M.D., University of
Rochester, 1956. (See Department
of Microbiology and Immunology.)

Philip A. Ludbrook, M.B., B.S.,
University of Adelaide, 1963. (See
Department of Radiology.)

Jay M. McDonald, B.S., Tufts
University, 1965; M.D., Wayne State
University, 1969. (See Department
of Pathology.) (Director of
Diagnostic Laboratories, Barnes
Hospital.)

Philip W. Majerus, M.D.,
Washington University, 1961. (See
Department of Biological
Chemistry.)

Gerald Medoff, A.B., Columbia
College, 1958; M.D., Washington
University, 1962. (See Department
of Microbiology and Immunology.)

Aubrey R. Morrison, M.B., B.S.,
University of London, 1970. (See
Department of Pharmacology.)

Charles W. Parker (Howard
Hughes Medical Institute
Investigator in Medicine), M.D.,
Washington University, 1953. (See
Department of Microbiology and
Immunology.)

M. Alan Permutt, A.B., Johns
Hopkins University, 1961; M.D.,
Washington University, 1965.

H. Mitchell Perry, Jr., M.D.,
Washington University, 1946.

Selma and Herman Seldin
Professor of Medicine

John A. Pierce, M.D., University of
Arkansas, 1948.

David Schlessinger
(Microbiology), B.A., University of
Chicago, 1955; B.S., 1957; Ph.D.,
Harvard University, 1960. (See
Department of Microbiology and
Immunology.)

William B. Kountz Professor of Medicine

Gustav Schonfeld, A.B., Washington
University, 1956; M.D., 1960.

Benjamin D. Schwartz (Howard
Hughes Medical Institute
Investigator in Medicine), B.A.,
Columbia College, 1965; Ph.D.,
Albert Einstein College of
Medicine, 1971; M.D., 1972. (See
Department of Microbiology and
Immunology.)

Robert M. Senior, A.B., Oberlin
College, 1957; M.D., George
Washington University, 1961.

Barry A. Siegel, A.B., Washington
University, 1965; M.D., 1969. (See
Department of Radiology.)

Eduardo Slatopolsky, M.D.,
University of Buenos Aires, 1959.

The Tobias and Hortense Lewin
Professor of Cardiovascular Diseases

Burton E. Sobel, A.B., Cornell
University, 1958; M.D., Harvard
University, 1962.

John D. Vavra, B.A., University of
Colorado, 1950; M.D., Washington
University, 1954. (See
Administration.)

Research Professor

Irene E. Karl, B.S., University of
Wisconsin, 1937; M.A., 1938; Ph.D.,
1940.

Professors Emeriti (Clinical)

Paul O. Hagemann, A.B.,
Washington University, 1930; M.D.,
1934.

Clinton W. Lane (Dermatology),
A.B., St. Mary's College, 1916; M.D.,
St. Louis University, 1921.

Morris D. Marcus (Dermatology),
M.D., Washington University, 1934.

Edward Massie, A.B., Washington
University, 1931; M.D., 1935.

Franz U. Steinberg, M.D., University
of Berne, 1938. (See Department of
Surgery.)

Professors (Clinical)

- I. J. Flance**, A.B., Washington University, 1931; M.D., 1935.
- Bernard T. Garfinkel**, M.D., Washington University, 1948.
- Ralph V. Gieselman**, M.D., Washington University, 1947.
- Neville Grant**, A.B., Yale University, 1950; M.D., Columbia University, 1954.
- Harold J. Joseph**, B.A., University of Texas, 1947; M.D., 1950.
- Michael M. Karl**, B.S., University of Wisconsin, 1936; M.D., University of Louisville, 1938.
- Marvin E. Levin**, A.B., Washington University, 1947; M.D., 1951.
- Virgil Loeb, Jr.**, M.D., Washington University, 1944.
- William V. Miller** (Visiting Staff), A.B., University of Missouri, 1962; M.D., 1966. (See Department of Pathology.)
- G. Charles Oliver**, A.B., Harvard University, 1953; M.D., 1957.
- Robert C. Packman**, A.B., Washington University, 1953; B.S. Med., University of Missouri, 1954; M.D., Washington University, 1956.
- Robert Paine**, M.D., Harvard University, 1944.
- Burton A. Shatz**, A.B., Washington University, 1940; M.D., 1943.
- Laurence A. Sherman**, B.A., B.S., University of Chicago, 1956; M.D., Albany Medical College, 1964. (See Department of Pathology.)

Associate Professor Emeritus

- Anthony P. Fletcher**, B.M., University of London, 1943; B.S., 1943; M.D., 1949.

Associate Professors

- C. Elliott Bell, Jr.**, B.S., Tulane University, 1960; M.D., 1964. (See Department of Pathology.)
- Dennis M. Bier**, B.S., LeMoyne College, 1962; M.D., New Jersey College of Medicine, 1966. (See Department of Pediatrics.)
- Stanley J. Birge, Jr.**, B.A., Amherst College, 1959; M.D., Washington University, 1963.

- Eric J. Brown**, A.B., Harvard University, 1971; M.D., 1975. (See Department of Microbiology and Immunology.)
- Michael E. Cain**, B.A., Gettysburg College, 1971; M.D., George Washington University, 1975.
- Peter B. Corr** (Pharmacology), B.S., Union University, 1971; Ph.D., Georgetown University, 1975. (See Department of Pharmacology.)
- James A. Delmez**, A.B., Washington University, 1969; M.D., University of Rochester, 1973.
- David N. Dietzler** (Clinical Chemistry), A.B., Washington University, 1957; Ph.D., 1963. (See Department of Pathology.)
- Ali A. Ehsani**, M.D., Tehran University, 1965. (See Irene Walter Johnson Institute of Rehabilitation.)
- Lawrence D. Gelb**, B.S., University of Michigan, 1963; M.D., Harvard University, 1967. (See Department of Microbiology and Immunology.)
- Edward M. Geltman**, B.S., Massachusetts Institute of Technology, 1967; M.D., New York University, 1971. (See Department of Radiology.)
- Jeffrey I. Gordon**, A.B., Oberlin College, 1969; M.D., University of Chicago, 1973. (See Department of Biochemistry.)
- Richard W. Gross**, A.B., Columbia College, 1972; M.D., New York University, 1976; Ph.D., Washington University, 1982. (Also Department of Chemistry.)
- Samuel B. Guze**, M.D., Washington University, 1945. (See Administration and Department of Psychiatry.)
- Marc R. Hammerman**, Established Investigator of the American Heart Association; A.B., Washington University, 1969; M.D., 1972.
- Geoffrey P. Herzig**, B.S., University of Cincinnati, 1963; M.D., Western Reserve University, 1967.
- Scot G. Hickman** (Clinical Academic), A.B., Duke University, 1966; M.D., Washington University, 1970.

- Allan S. Jaffe**, B.S., University of Maryland, 1968; M.D., 1973.
- Stanley J. Korsmeyer** (Howard Hughes Medical Institute Investigator in Medicine), B.S., University of Illinois, 1972; M.D., 1976. (See Department of Microbiology and Immunology.)
- Donald J. Krogstad**, A.B., Bowdoin College, 1965; M.D., Harvard University, 1969. (See Department of Pathology.) (Director of Microbiology Laboratory, Barnes Hospital.)
- Ronald Krone** (John E. Simon Scholar in Medicine), M.D., University of Chicago, 1966.
- Anthony Kulczycki, Jr.**, A.B., Princeton University, 1966; M.D., Harvard University, 1970. (See Department of Microbiology and Immunology.)
- Louis G. Lange, III**, A.B., University of Rochester, 1970; M.D., Harvard University, 1976; Ph.D., 1976. (See Department of Pathology.)
- Kenneth M. Ludmerer**, A.B., Harvard University, 1968; M.A., Johns Hopkins University, 1971; M.D., 1973.
- Richard P. MacDermott**, B.A., Oberlin College, 1965; M.D., Ohio State University, 1969.
- John A. McDonald**, B.A., University of South Florida, 1965; M.S., 1967; Ph.D., Rice University, 1970; M.D., Duke University, 1973. (See Department of Biochemistry.)
- Kevin J. Martin**, M.B., B.Ch., B.A.O., University College of Dublin, 1971.
- Robert P. Mecham**, B.S., University of Utah, 1973; Ph.D., Boston University, 1976. (See Department of Cell Biology and Physiology.)
- Thalachallour Mohanakumar**, B.S., Madras Veterinary College, 1966; M.Sc., All India Institute of Medical Science, 1969; Ph.D., Duke University, 1974. (See Departments of Pathology and Surgery.)
- Patrick R. Murray** (Clinical Microbiology), B.S., St. Mary's College, 1969; Ph.D., University of California, 1974. (See Department of Pathology.)
- Richard E. Ostlund, Jr.**, B.S., University of Utah, 1966; M.D., 1970.

Julio E. Perez, B.S., University of Puerto Rico, 1970; M.D., 1973.

Robert P. Perrillo, B.S., Fordham University, 1966; M.D., Georgetown University, 1970.

Mabel L. Purkerson, A.B., Erskine College, 1951; M.D., Medical College of South Carolina, 1956. (See Administration and Department of Pediatrics.)

John C. Rogers, B.S., University of Nebraska, 1966; M.S., 1968; M.D., 1968. (Also Department of Biology.)

Rodolphe Ruffy, M.D., University of Lausanne, 1968.

Julio V. Santiago, B.S., Manhattan College, 1963; M.D., University of Puerto Rico, 1967. (See Department of Pediatrics.)

Samuel A. Santoro, B.S., Emory University, 1972; M.D., Vanderbilt University, 1979; Ph.D., 1979. (See Department of Pathology.)

Louis Simchowitz, B.S., City College of New York, 1966; M.D., New York University, 1970. (See Department of Cell Biology and Physiology.)

Isaias Spilberg, B.S., University of San Marcos, 1956; M.D., 1963.

William F. Stenson, B.A., Providence College, 1967; M.D., Washington University, 1971.

Alan J. Tiefenbrunn, A.B., Washington University, 1970; M.D., 1974. (See Department of Radiology.)

Douglas M. Tollefsen, B.A., Grinnell College, 1970; M.D., Washington University, 1977; Ph.D., 1977. (See Department of Biological Chemistry.)

Peter G. Tuteur, A.B., Johns Hopkins University, 1962; M.D., University of Illinois, 1966.

H. James Wedner, A.B., Cornell University, 1963; M.D., 1967.

Howard G. Welgus (Dermatology), B.A., Rice University, 1973; M.D., Washington University, 1977.

Michael P. Whyte, B.A., New York University, 1968; M.D., State University of New York, 1972. (See Department of Pediatrics.)

George D. Wilner, B.S., Northwestern University, 1962; M.D., 1965. (See Department of Pathology.)

Gary R. Zuckerman, B.S., St. Louis College of Pharmacy, 1958; D.O., Kansas City College of Osteopathic Medicine, 1963.

Research Associate Professors

Joseph J.H. Ackerman (Chemistry), B.A., Boston University, 1971; Ph.D., Colorado State University, 1977.

Hans D. Ambos, C.E.E., Washington University, 1973.

Janina M. Brajtburg, M.S., University of Lodz, 1950; Ph.D., 1968.

Norma A. Fletcher, M.S., Technical University, 1949; Ph.D., University of Copenhagen, 1965.

James G. Miller, A.B., St. Louis University, 1964; M.A., Washington University, 1966; Ph.D., 1969. (Also Faculty of Arts and Sciences.)

Jeremiah J. Morrissey, B.A., MacMurray College, 1969; Ph.D., St. Louis University, 1974.

Bellur Seetharam, B.S., Mysore University, 1961; M.S., Bangalore University, 1965; Ph.D., 1972.

Associate Professors Emeriti (Clinical)

James W. Bagby (Dermatology), A.B., University of Missouri, 1930; B.S.Med., 1931; M.D., Washington University, 1933.

Stanley F. Hampton, A.B., Washington and Lee University, 1930; M.D., Washington University, 1934.

Associate Professors (Clinical)

Jack Barrow, M.D., Washington University, 1946.

Benjamin A. Borowsky, M.D., Washington University, 1958.

Arnold Dankner, M.D., Washington University, 1947.

Arthur H. Gale, B.S., Washington University, 1955; M.D., University of Missouri, 1959.

John J. Garrett, M.D., Harvard University, 1951. (See Medical Care Group.)

Melvin L. Goldman, A.B., Washington University, 1939; M.D., 1943.

Siddhesh Gowda, M.B., B.S., Medical College Bellary Mysore, 1969.

James N. Heins, A.B., University of Louisville, 1957; M.D., 1961.

Owen S. Kantor, M.D., University of Missouri, 1968.

Robert S. Karsh, A.B., Washington University, 1951; M.D., 1952.

John J. Kelly, B.S., Rockhurst College, 1959; M.D., St. Louis University, 1963.

Charles Kilo, M.D., Washington University, 1959.

Philip E. Korenblat, M.D., University of Arkansas, 1960.

Joseph Levitt, M.D., Washington University, 1949.

David M. Lieberman, M.D., Vanderbilt University, 1949.

Harvey Liebhaber, A.B., New York University, 1953; M.D., 1957.

Herbert Lubowitz, A.B., Clark University, 1954; M.D., Washington University, 1958.

William E. Magee, M.D., Duke University, 1950.

Edward J. Miller, B.A., St. John's University, 1958; M.D., St. Louis University, 1962.

James F. Nickel, A.B., University of Oklahoma, 1944; M.D., Washington University, 1948.

Charles C. Norland, B.S., Washington State University, 1955; M.D., Washington University, 1959.

Mary L. Parker, B.S., Florida State University, 1946; M.S., 1949; M.D., Washington University, 1953. (University Health Service.)

William D. Perry, A.B., Northwest Missouri State College, 1943; B.S.Med., University of Missouri, 1945; M.D., Washington University, 1947.

Lester T. Reese (Dermatology), M.D., Tulane University, 1966.

Ernest T. Rouse, B.S., Alabama Polytechnic Institute, 1939; M.D., Washington University, 1943.

Shabbir H. Safdar, F.Sc., Government College Jhang, 1954; M.D., Nishtar Medical College, 1961.

Llewellyn Sale, Jr., A.B., Yale University, 1936; M.D., Washington University, 1940.

James C. Sisk (Dermatology), A.B., Washington University, 1943; M.D., 1946.

Ross B. Sommer, A.B., Miami University, 1949; M.D., Cornell University, 1949.

J. Allen Thiel, B.S., Rockhurst College, 1956; M.D., St. Louis University, 1960.

Stanley M. Wald, M.D., Washington University, 1946.

Alan N. Weiss, B.A., Ohio State University, 1963; M.D., 1966.

Alvin S. Wenneker, A.B., Washington University, 1949; M.D., 1953.

Assistant Professors

Elliot E. Abbey (Clinical Academic), A.B., Cornell University, 1971; M.D., New York University, 1975.

Parveen Ahmed, M.B.B.S., Karachi University, 1970. (See Department of Pathology.)

Benico Barzilai, B.S., Case Western Reserve, 1974; M.D., University of Illinois, 1978.

Steven R. Bergmann (Medical Physiology), B.A., George Washington University, 1972; Ph.D., Hahnemann Medical College, 1977; M.D., Washington University, 1985.

Joseph J. Billadello, B.S., SUNY at Stony Brook, 1973; M.D., Georgetown University, 1978.

George J. Broze, Jr., B.S., University of Washington, 1968; M.D., Washington University, 1972.

Edward J. Campbell, B.S., Purdue University, 1969; M.D., Washington University, 1972.

Dennis M. Cassidy, B.S., Acadia University, 1974; B.M.S., Memorial University, 1976; M.D., 1978.

Kwok-Ming Chan, Ph.D., University of South Dakota, 1977. (See Department of Pathology.)

David D. Chaplin (Howard Hughes Medical Institute Associate Investigator), A.B., Harvard College, 1973; M.D., Ph.D., Washington University, 1980. (See Department of Microbiology and Immunology.)

Ray E. Clouse, B.S., Purdue University, 1973; M.D., Indiana University, 1976.

William E. Clutter, B.S., Ohio State University, 1972; M.D., 1975. (Also Clinical Research Center.)

Jonathan A. Cohn, B.A., Harvard University, 1972; M.D., Cornell, 1978.

Wenying Cui (Visiting), M.D., Beijing Medical College, China, 1961; Ph.D., 1965.

Carlos C. Daughaday, A.B., Harvard University, 1967; M.D., Washington University, 1971.

Paul R. Eisenberg, B.S., Tulane University, 1975; M.P.H., T.M., Tulane School of Public Health, 1980; M.D., New York Medical College, 1980.

Mark E. Frisse, B.S., University of Notre Dame, 1974; M.D., Washington University, 1978.

Stephen J. Giddings, A.B., Dartmouth College, 1968; Ph.D., 1973; M.D., University of Rochester, 1976.

Stephen L. Gluck, B.S., Yale University, 1973; M.D., University of California, 1977. (See Department of Cell Biology and Physiology.)

Anne C. Goldberg, B.A., Radcliffe College, Harvard University, 1973; M.D., University of Maryland, 1977.

Gregory I. Goldberg (Dermatology), M.Sc., Moscow State University, 1969; Ph.D., Weizmann Institute of Science, 1977. (See Department of Microbiology and Immunology.)

James A. Goldstein, B.S., University of Illinois, 1972; M.D., University of Chicago School of Medicine, 1976.

J. Blake Goslen III (Dermatology), B.S., Davidson College, 1965; M.D., University of North Carolina, 1973. (See Department of Otolaryngology.)

Gregory A. Grant (Dermatology), B.S., Iowa State University, 1971; Ph.D., University of Wisconsin, 1975. (See Department of Biological Chemistry.)

Curt H. Hagedorn, A.B., Rutgers College, 1972; M.M.S., Rutgers Medical School, 1974; M.D., Washington University, 1976. (Also Department of Biology.)

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Instructors (Clinical)

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John A. Powell (Dermatology), B.S., University of Notre Dame, 1967; M.D., University of Michigan, 1971.

Robert J. Raish, A.B., Washington University, 1976; M.D., 1980.

William R. Reilly, B.A., Southern Illinois University, 1974; M.D., University of Illinois, 1980.

Lisa B. Ring, B.A., Washington University, 1976; M.D., 1980.

Ernest T. Rouse III, B.A., Princeton University, 1967; M.D., Washington University, 1971.

Mehrdad Saeed-Vafa, M.D., Ferdowsi University, 1973.

Scott R. Sale, B.A., Williams College, 1972; M.D., St. Louis University, 1976.

Robert J. Saltman, B.A., Yale University, 1976; M.D., Washington University, 1980.

Lawrence E. Samuels (Dermatology), B.A., University of Texas, 1972; M.D., Washington University, 1976.

Guadalupe Sanchez, A.B., University of Colorado, 1972; Ph.D., Duke University, 1980; M.D., 1980.

Robert J. Scheff, A.B., Dartmouth College, 1970; M.D., Washington University, 1974.

Robert J. Schneider, A.B., Johns Hopkins University, 1973; M.D., 1976.

Susan B. Schneider, A.B., Swarthmore College, 1973; M.D., Yale University, 1977.

John S. Schoentag (Dermatology), A.B., University of Missouri, 1956; M.D., Washington University, 1960.

Kenneth E. Shafer, B.A., College of Wooster (OH), 1975; M.D., St. Louis University, 1979.

Anil S. Shah, B.S., St. Xavier's College, University of Gujarat, 1972; M.D., Smt. N.H.L. Medical College, Agnedabad, India, 1978.

Bharat J. Shah, M.B., B.S., Guharat University, 1973.

John B. Shapleigh II, M.D., Washington University, 1946.

Gerald S. Shatz, B.A., Northwestern University, 1970; M.D., Washington University, 1974.

Bernard L. Shore, B.S., Washington University, 1972; M.D., 1977.

Robert B. Shuman, B.A., Brandeis University, 1977; M.D., University of Missouri, 1981.

John S. Skinner, M.D., Washington University, 1940.

Donald A. Skor, B.A., Washington University, 1973; M.D., Rush Medical College, 1978.

David Smuckler, B.S., Georgetown University, 1974; M.D., 1978.

Rand Sommer, B.S., Davidson College, 1976; M.D., Washington University, 1980.

Elizabeth A. Stoddard, B.S., Montana State University, 1954; M.D., Washington University, 1957.

William K. Sullivan, B.S., United States Military Academy, 1966; M.D., University of Missouri, 1974.

In-Sook Sunwoo, M.D., Woo Sok University, 1959.

Arnold S. Tepper, B.S., St. Louis College of Pharmacy, 1966; M.D., University of Missouri, 1970.

Wanda T. Terrell, A.B., Washington University, 1975; M.D., 1979. (See Medical Care Group.)

William M. Thomson, B.S., Davidson College, 1969; M.D., Johns Hopkins University, 1973.

Sharon F. Tiefenbrunn (Dermatology), A.B., Washington University, 1971; M.D., 1975.

Alice W. Trotter, B.A., Mount Holyoke College, 1962; M.D., Washington University, 1969.

David J. Tucker, B.S., University of Notre Dame, 1977; M.D., St. Louis University, 1981.

Dolores R. Tucker (Dermatology), B.S., St. Mary's of Notre Dame, 1958; M.D., Washington University, 1974.

John H. Uhlemann (Dermatology), B.A., Grinnell College, 1967; M.D., Washington University, 1971.

Albert L. Van Amburg III, A.B., Washington University, 1968; M.D., 1972.

Oksana Volshteyn, M.D., Minsk State Medical Institute, Minsk, U.S.S.R., 1976.

Richard C. Walters (Dermatology), B.S., University of Illinois, 1969; M.D., Washington University, 1973.

Hugh R. Waters, B.S., Northwestern University, 1942; M.D., Washington University, 1945.

Daniel W. Whitehead, Jr., B.S., Drexel University, M.D., Washington University, 1980.

James R. Wiant, A.B., Princeton University, 1955; M.D., Jefferson Medical College, 1959.

Herbert C. Wiegand, A.B., Washington University, 1940; M.D., 1943.

R. Jerome Williams, Jr., A.B., Harvard University, 1973; M.D., Duke University, 1977.

Edward M. Wolfe (Dermatology), B.A., Hobart College, 1956; M.D., Washington University, 1960.

James A. Wood, A.B., Westminster College, 1947; M.D., Washington University, 1949.

Robert E. Ziegler (Dermatology), B.A., University of Colorado, 1972; Ph.D., Duke University, 1980; M.D., 1986.

Research Associates

Thorbjorn Amundsen, M.D., Autonomous University of Guadalajara School of Medicine, 1977.

Vinay Bansal, B.S., University of Delhi; M.S., National Dairy Research Institute; Ph.D., Postgraduate Institute of Medical Education and Research.

Nalini S. Bora, B.Sc., A.M.U.-India, 1973; M.Sc., 1975; Ph.D., All India Institute of Medical Sciences, 1981.

Thomas J. Broekelman, B.A., University of Missouri, St. Louis, 1977; M.S., 1981.

Ivan R. Collier (Dermatology), B.S., Kentucky Wesleyan College, 1968; M.S., 1970; M.S., Florida State University, 1975; Ph.D., 1980.

Michael Courtois, B.S., Southeast Missouri State University, 1973; B.S., Washington University, 1977; M.A., University of Missouri, Columbia, 1979.

Donna M. Crecelius, B.S., St. Mary's College 1976; Ph.D., St. Louis University, 1983.

Hans Deckmyn, Ph.D., Catholic University of Leuven, 1980.

Svetlana G. Elberg, B.S., University of Kharkov, 1954; M.S., 1959.

Ann M. Grace, A.B., Bryn Mawr College, 1954; A.M., Washington University, 1956; Ph.D., St. Louis University, 1970.

Walter T. Gregory, B.S., St. Louis University, 1960.

Pilar Herrero, B.S., Loyola University, 1981; M.S., Vanderbilt University, 1984.

Shingo Kinoyama, M.D., Kagoshima University, Japan, 1977; Ph.D., Okayama University, 1986.

Toshihiko Kumada, Ph.D., University of Osaka, Japan, 1985.

Patricia M. McKevitt, B.A., Clarke College, 1967; M.S.W., Washington University, 1969.

Ramaswamy Muthiah, M.S., University of Madras, 1977; Ph.D., 1983.

Kaoru Okada, M.D., Kyushu University (Japan), 1977; Ph.D., 1985.

Audrey A. Painter, B.S., Southern Florida College, 1955; M.D., Northwestern University, 1957.

William T. Roswit (Dermatology), B.A., Washington University, 1973.

Bakula L. Trivedi, M.S., Sarvajanik Science College, 1961.

Carol A. Weerts, R.N., St. John's Hospital School of Nursing, 1960; B.S., Washington University, 1965; B.S., 1975; M.A., Webster College, 1980.

Jesse T. Yates, B.S., Fisk University, 1956.

Research Assistants

Sharon E. Carmody, B.A., Webster College, 1960.

May W-S Chen, B.S., Baker University, 1963.

Howard L. Christopherson, B.S., University of Minnesota, 1949; M.S., 1953.

Adriana Dusso, M.S., Universidad Nacional de Rosario (Argentina), 1976; Ph.D., 1984.

Margaret W. Erlanger, B.A., University of Iowa, 1932; M.S., 1938.

Jane Lewis Finch, B.S., Central Missouri State University, 1971.

Thomas Howard, Sr.

Milan D. Kapadia, B.S., Gujarat University, 1972; M.D., Indore University, 1974.

Charles L. McConkey, Jr., B.A., Illinois Wesleyan University, 1969; M.S., Southern Illinois University, 1975.

Dale F. Osborne, B.S., Louisiana State University, 1971.

Claire K. Pedersen, B.S., Quincy College, 1948.

Betty F. Perry, A.B., Washington University, 1945.

Sharon A. Rogers, B.A., Southern Illinois University, 1981; M.S., 1983.

Assistants (Clinical)

Scott J. Anderson, B.A., University of California, San Diego, 1975; Ph.D., Duke University, 1981; M.D., 1982.

Ellen F. Binder, B.A., University of Michigan, 1977; M.D., Washington University, 1981.

Carl F. Blatt, Jr., B.A., Vanderbilt University, 1976; M.D., Georgetown University, 1980. (See Medical Care Group.)

Irl J. Don, A.B., Washington University, 1968; M.D., 1972. (See Medical Care Group.)

Kathleen M. Garcia, B.S., University of California, 1976; M.D., Harvard University, 1980. (See Medical Care Group.)

Daniel P. Gluckstein, B.S., University of Michigan, 1977; M.D., Washington University, 1981. (See Medical Care Group.)

Nancy Z. Guggenheim, B.S., Brown University, M.D., 1980.

Faith H. Holcombe, B.A., Harvard University, 1976; M.D., Washington University, 1980. (See Medical Care Group.)

Ronald W. Leong, A.B., Washington University, 1976; M.D., 1981. (See Medical Care Group.)

John E. Mullins, A.B., Washington University, 1954; M.D., 1958.

John H. Rice, B.S., St. Louis University, 1976; M.D., University of Missouri, 1980.

Michael L. Spearman, B.S., Kansas State University, 1978; M.D., University of Kansas, 1982.

Karen S. Winters, M.D., Southern Illinois University, Carbondale, 1983.

***DEPARTMENT OF
MICROBIOLOGY
AND
IMMUNOLOGY***



MICROBIOLOGY AND IMMUNOLOGY

This department, in collaboration with the Division of Infectious Diseases, Department of Medicine, teaches introductory courses in microbiology and infectious diseases for first-year medical students and for graduate students. The courses are concerned particularly with principles of microbial physiology and genetics, and of immunology and, through a limited survey of pathogenic bacteria, viruses, and fungi, attempts to prepare medical students for more advanced study of infectious diseases. The department also offers a number of advanced elective research activities. A limited number of summer research fellowships are available.

FIRST YEAR

Medical Microbiology

Medical Microbiology consists of immunology, microbial genetics and physiology, basic information on pathogenic microorganisms including viruses, bacteria, fungi, and parasites, and studies on the pathophysiology of infectious diseases. These subjects are presented in three courses offered during the second and third trimesters of the first year. Immunology (2nd trimester) focuses on the structure and biosynthesis of antibodies, elements of cell-mediated immunity and the host response to pathogens and other antigenic stimuli. Included in the latter are normal, deficient, and inappropriate responses and discussions of the beneficial and detrimental aspects of specific and non-specific activities. Molecular biology (second trimester) introduces distinctive features of the prokaryotic cell with emphasis on the structure and dynamics of the prokaryotic genome. Mechanisms of regulating gene expression, structure and replication of bacterial viruses (phage), and the principles of recombinant DNA technology are presented. Microbiology (3rd trimester) integrates basic information about structure and growth of a wide range of microorganisms with consideration of the effects of the organisms on the human host. The basic ecology of microbial populations and mechanisms of action of antibiotics are presented. Lectures on pathophysiology of infectious diseases emphasize mechanisms of infection, identification of the organism and means of treatment.

In both the immunology and microbiology courses, laboratory demonstration, and discussion sessions supplement lecture material. In the final weeks of Microbiology, small teams of students, led by a clinical fellow, will work up current infectious disease cases and identify the causative agents through use of current diagnostic microbiology techniques.

A wide selection of mini-electives are offered to allow students to pursue in some depth a specific area of Medical Microbiology by means of seminar-type discussion groups, led by faculty members.

Individuals other than medical students may register for individual segments of the course; see listing for the Division of Biology and Biomedical Sciences, under: Bio 517, Immunology (4 units) and Bio 5351, Molecular Biology (2 units).

RESEARCH

Bio 590.

These electives acquaint the student with the analyses that are used in present-day biomedical research, especially at the molecular level. *Staff*

Processing and decay of RNA in *E. coli* and mammalian cells, normal and malignant. Differentiation-activation of unexpressed genes in mammalian cells.

Dr. Apirion

Immunogenetics of complement proteins and the biochemistry and function of cell surface receptors for immunoglobulins and complement. *Dr. Atkinson*

Mechanisms and evolution of gene transposition and of antibiotic resistance in bacteria. *Dr. Berg*

Mechanisms and control of phagocytic function. Biochemistry and cellular physiology of IgG and complement receptors and the cellular pathways needed for their efficient function are studied in detail.

Dr. Brown

Structure, organization and regulation of expression of class III MHC genes. *Dr. Chaplin*

Genetics and molecular biology of *Mycobacterium leprae*. *Dr. Clark-Curtiss*

Regulation of complement and acute phase protein gene expression, pulmonary immunology, inflammation. *Dr. Colten*

Biomedical polymorphism of Ir gene products is studied with the aim of relating structure to immunoregulatory function. *Dr. Cullen*

Structure and biosynthesis of antibodies; immunoglobulin gene expression in hybridoma cells.

Dr. Fleischman

Biochemistry of tumor viruses, varicella-zoster, and hepatitis B virus. *Dr. Gelb*

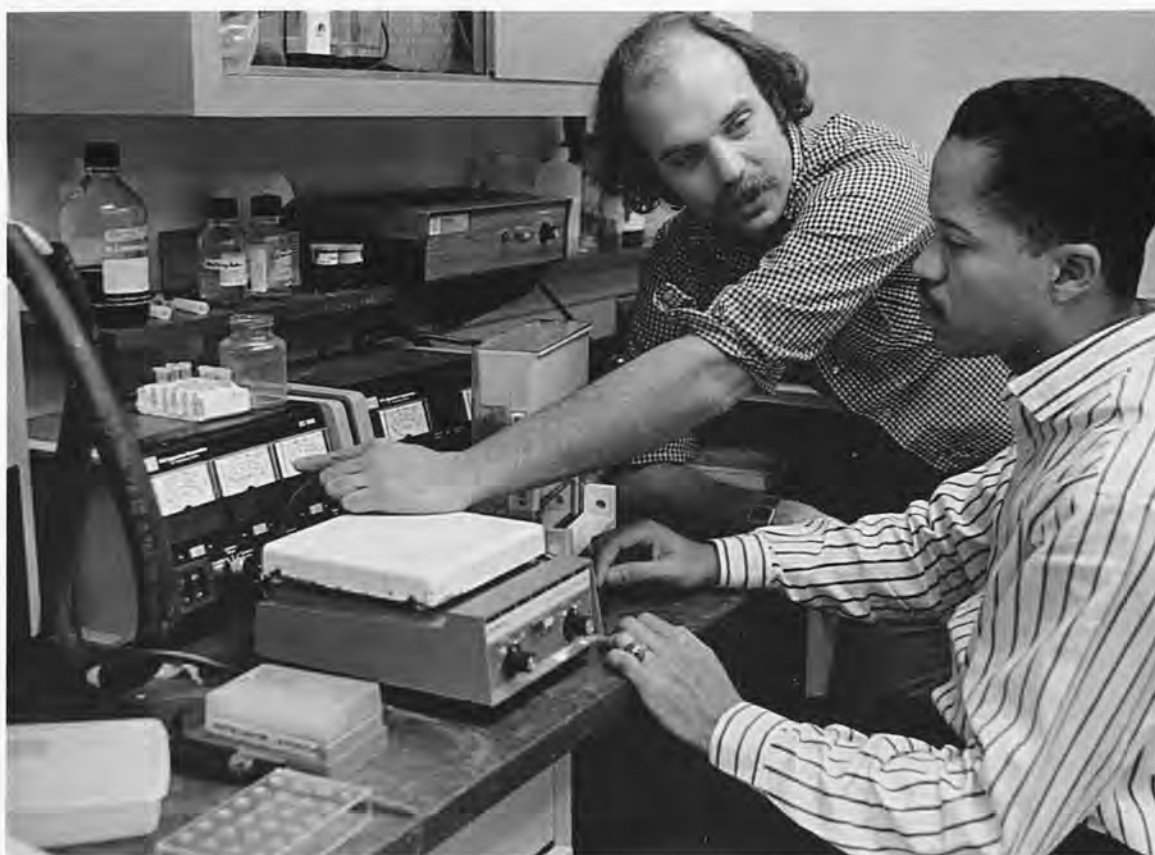
Enzymology of connective tissue remodeling. Structure of mouse minor satellite DNA. *Dr. Goldberg*

Molecular basis of pathogenicity of *Histoplasma capsulatum* and *Bordetella pertussis*. In vitro models of respiratory tract infections and toxin effects. Biochemical analysis and genetic manipulation of virulence-related phenotypes. *Dr. Goldman*

Immunity to haemophilus influenzae. *Dr. Granoff*

Molecular biology of multigene families. *Dr. Huang*

Mechanisms of action of immune response genes. *Dr. Kapp-Pierce*



Biochemistry and genetics of macromolecule regulation: mRNA metabolism in bacteria; regulation of metabolism in cultured mammalian cells. *Dr. Kennell*

Exploring the molecular genetics of normal human lymphoid differentiation and the mechanisms of transformation for the corresponding lymphoid malignancies. *Dr. Korsmeyer*

Interactions of IgE and IgE receptors, structure of IgE and Fc receptors, mechanisms of immediate hypersensitivity. *Dr. Kulczycki*

Differentiation and function of mononuclear phagocytes. *Dr. Lin*

The structure and biosynthesis of lymphocyte cell surface antigens and lymphocyte triggering mechanisms. The effects as adjuvants in modulating the immune response. *Dr. Little*

Molecular biology of the T cell receptor genes including transfection and transgenic mouse studies. *Dr. Lob*

Development of therapy for intracellular bacterial and fungal infections. *Drs. Kobayashi, Medoff*

Role of T lymphocytes in resistance to infection with bacteria that live in the extracellular environment. *Dr. Markham*

Tumor immunotherapy. Establishment of animal models of human malignancy. *Dr. Medoff*

Cellular immunology; immediate hypersensitivity. *Dr. Parker*

Human B cell activation and the role of soluble factors in B cell immunoregulation in both normal peripheral blood and intestinal lymphocytes and in patients with chronic GI and liver disease. *Dr. Peters*

Mechanisms regulating immune responses in tissue culture systems. *Dr. Pierce*

Studies of the immunological and pharmacological mechanisms by which autacoids (i.e., local hormones) regulate lymphocyte function. *Dr. Polmar*

Molecular approaches to understand the pathogenicity of facultative intracellular bacterial pathogens *Yersinia* and *Listeria*. *Dr. Portnoy*

Structure and function of human retroviruses including HTLV1, a cause of Leukemia, and HTLV3, the cause of AIDS. The major focus is in studying molecular clones of these viral genes important in replication and regulating abnormalities in cell growth. *Dr. Ratner*

Molecular genetics of animal RNA viruses (alpha-viruses and flaviviruses): replication, packaging, and virulence. *Dr. Rice*

Interactions between RNA animal viruses and their host cells. Emphasis on maturation and assembly of viral proteins. The immune response to viruses: formation and properties of infectious viral-antibody complexes. *Dr. M. Schlesinger*

Structure and replication of enveloped RNA animal viruses. *Dr. S. Schlesinger*

Ribosome formation; processing and turnover of RNA in bacteria and mammalian cells. *Dr. D. Schlessinger*

Molecular immunology, immunobiology and immunopathology, biochemistry and molecular biology of macrophage activating lymphokines. *Dr. Schreiber*

Structure of histocompatibility and immune response region associated antigens. Molecular mechanisms underlying HLA-disease association. Mechanisms of HLA-disease associations. *Dr. Schwartz*

Response to polysaccharide antigens in children. *Dr. Shackelford*

Study of the molecular biology of the T-200 family of leukocyte proteins. The purpose is to characterize this family of proteins which are specific only for leukocytes but which differ among them. *Dr. Thomas*

ELECTIVES

At present the primary enrollees in these courses are students working for a Ph.D. degree in one of the basic sciences. However, these courses are recommended for interested medical students, especially those who may be considering a career in medical research. Emphasis is placed on the organization and function of living systems at the molecular level. The courses combine formal lectures with student-directed seminars. In the latter, each student has an opportunity to integrate various disciplines of modern molecular biology into the area of biology or medicine that is of particular interest to him. Those courses most relevant to the field of microbiology are listed under the Division of Biology and Biomedical Sciences.



Bio 5051. Foundations in Immunology

An in-depth introduction to immunology designed for graduate students. Topics: antibody structure and genetics, B cell recognition, T cell receptor, major histocompatibility complex, T cell recognition, regulation of the immune response, immune mediators, humoral and cellular effector mechanisms, immune control of infectious disease, immunopathology including hypersensitivity and deficiency. Credit 3 units. *Dr. Cullen*

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research on pathogenic microorganisms and their virulence determinants. Emphasis on new research strategies for studying the molecular mechanisms of pathogenesis and the factors controlling host-pathogen interactions. Prerequisite: One and one half class hours per week, 1 unit credit. *Dr. Goldman*

Bio 5271, 5272. Topics in Immunology

Consideration of two or three changing topics in immunology. Background observations and current problems in the topic areas examined in a seminar format using primary literature. Each topic segment led by a different faculty member. Credit 2 units. *Dr. Pierce*

Bio 539. Topics in Animal Virology: The Molecular Biology of Animal and Plant Viral Diseases

RNA and DNA virus replication, shutoff of host protein biosynthesis, interferon, retroviruses with emphasis on chronic diseases (i.e., visna, AIDS), defective viruses (i.e., satellite RNA of tobacco ring spot virus, hepatitis delta virus), viruses as vectors and their possible role in preventing disease. Course consists of lectures and discussions of original papers. Credit 3 units. *Drs. M. Schlesinger; S. Schlesinger*

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty**Professor and Acting Head of Department**

Milton J. Schlesinger, B.S., Yale University, 1951; M.S., University of Rochester, 1953; Ph.D., University of Michigan, 1959.

Professors

David Apirion, M.S., Hebrew University of Jerusalem, 1960; Ph.D., University of Glasgow, 1963.

John P. Atkinson, A.B., Kansas University, 1965; M.D., 1969. (See Department of Medicine.)

Douglas E. Berg, B.S., Cornell University, 1964; Ph.D., University of Washington, 1969. (See Department of Genetics.)

Harvey R. Colten, B.A., Cornell University, 1959; M.D., Western Reserve University, 1963; M.A. (hon.), Harvard University, 1978. (See Department of Pediatrics.)

Susan E. Cullen, B.S., College of Mt. St. Vincent, 1965; Ph.D., Albert Einstein College, 1971. (See Department of Genetics.)

M. Wayne Flye, B.S., University of North Carolina, 1964; M.D., 1967; M.A., Duke University, 1972; Ph.D., 1980; M.A. (hon.), Yale University, 1985. (See Department of Surgery.)

Judith A. Kapp-Pierce, B.A., Miami University, 1965; M.S., Indiana University, 1969; Ph.D., Harvard University, 1976. (See Department of Pathology.) (Jewish Hospital.)

David E. Kennell, A.B., University of California, 1955; Ph.D., 1959.

George S. Kobayashi, B.S., University of California, 1952; Ph.D., Tulane University, 1963. (See Department of Medicine.)

J. Russell Little, Jr., A.B., Cornell University, 1952; M.D., University of Rochester, 1956. (See Department of Medicine.) (Jewish Hospital.)

Gerald Medoff, A.B., Columbia College, 1958; M.D., Washington University, 1962. (See Department of Medicine.)

Charles W. Parker, M.D., Washington University, 1953. (See Department of Medicine.)

Carl W. Pierce, A.B., Colgate University, 1962; Ph.D., University of Chicago, 1966; M.D., 1966. (See Department of Pathology.) (Jewish Hospital.)

Stephen H. Polmar, B.S., Union College, 1961; Ph.D., 1966; M.D., Case Western Reserve University, 1967. (See Department of Pediatrics.)

Sondra Schlesinger, B.S., University of Michigan, 1956; Ph.D., 1960.

David Schlessinger, B.A., University of Chicago, 1955; B.S., 1957; Ph.D., Harvard University, 1961. (See Department of Medicine.)

Robert D. Schreiber, B.A., State University of New York, 1968; Ph.D., 1973. (See Department of Pathology.)

Benjamin D. Schwartz, B.A., Columbia College, 1965; Ph.D., Albert Einstein College, 1971; M.D., 1972. (See Department of Medicine.)

Associate Professors

Eric J. Brown, A.B., Harvard University, 1971; M.D., 1975. (See Department of Medicine.)

Julian B. Fleischman, B.S., Yale University, 1955; Ph.D., Harvard University, 1960.

Lawrence D. Gelb, B.S., University of Michigan, 1963; M.D., Harvard University, 1967. (See Department of Medicine.)

Dan M. Granoff, B.A., Johns Hopkins University, 1965; M.D., 1968. (See Department of Pediatrics.)

Stanley J. Korsmeyer, B.S., University of Illinois, 1972; M.D., 1976. (See Department of Medicine.)

Anthony Kulczycki, Jr., A.B., Princeton University, 1966; M.D., Harvard University, 1970. (See Department of Medicine.)

Hsiu-san Lin, M.D., Taiwan University, 1960; Ph.D., University of Chicago, 1968. (See Department of Radiology.)

Penelope G. Shackelford, B.S., University of Wisconsin, 1964; M.D., Washington University, 1968. (See Department of Pediatrics.)

Assistant Professors

David D. Chaplin, A.B., Harvard University, 1973; Ph.D., Washington University, 1980; M.D., 1980. (See Department of Medicine.)

William E. Goldman, B.S., Indiana University, 1976; Ph.D., University of North Carolina, 1980.

Henry V. Huang, A.B., Occidental College, 1972; Ph.D., California Institute of Technology, 1977.

Dennis Loh, B.S., California Institute of Technology, 1973; M.D., Harvard University, 1977. (See Department of Medicine.)

Richard B. Markham, A.B., Harvard University, 1969; M.D., Albert Einstein College of Medicine, 1972. (See Department of Medicine.)

Marion Peters, M.B.B.S., Melbourne University, 1972. (See Department of Medicine.)

Daniel A. Portnoy, B.A., University of California, 1978; M.A., University of Washington, 1980; Ph.D., 1983.

Lee Ratner, B.A., M.A., Harvard University, 1973; M.D., Ph.D., Yale University, 1979. (See Department of Medicine.)

Charles M. Rice, B.S., University of California, 1974; Ph.D., California Institute of Technology, 1981.

Matthew L. Thomas, B.S., University of Utah, 1974; Ph.D., 1981. (See Department of Pathology.)

Research Assistant Professors

Josephine E. Clark-Curtiss, B.S., St. Mary's College, 1968; Ph.D., Medical College of Georgia, 1974.

Gregory I. Goldberg, M.Sc., Moscow State University of USSR, 1969; Ph.D., Weizmann Institute of Science, 1977. (See Department of Medicine.)

Research Assistant

Richard J. McDonald

**DEPARTMENT OF
NEUROLOGY AND
NEUROLOGICAL
SURGERY**



NEUROLOGY AND NEUROLOGICAL SURGERY

Neurology and neurological surgery concern themselves with the diseases of brain, spinal cord, peripheral nerves, and muscles. An introduction to the anatomy and physiology of the nervous system is presented in the first-year course in neural sciences provided by the Departments of Anatomy and Neurobiology and of Cell Biology and Physiology. In the second year, the department presents the course in Pathophysiology of Nervous System Disorders. Here are demonstrated the interrelationships between knowledge derived from basic investigative and clinical sources. The department also participates in the Preparation for Clinical Medicine course. In addition, there are lectures and exercises with patients in neurological physical diagnosis. A full-time, four-week clerkship in the third year, with collaborative teaching by both Neurology and Neurological Surgery services, introduces the phenomenology of the diseased nervous system. In the fourth year, there are opportunities for clinical externships and many varieties of research experience.

Several groups of faculty members are established for specialized research and teaching purposes. They include:

James L. O'Leary Division of Experimental Neurology and Neurological Surgery, *Dr. Woolsey* (Director).
Division of Neuropsychology, *Dr. Posner* (Director),
Drs. Crosson, Deuel, Fox, Petersen.

Division of Pediatric Neurology, *Dr. Volpe* (Director),
Drs. Deuel, Dodge, Dodson, Holowach Thurston,
Johnson, Noetzel, Prensky, Rothman.

Division of Clinical Neuropharmacology,
Dr. Ferrendelli (Director), *Drs. Clifford, Dodson,*
Morris.

Division of Neuromuscular Diseases, *Dr. Brooke*
(Director), *Mr. Kaiser* (Administrator and Director
of Research Services), *Drs. Eliasson, Nemeth,*
Ms. Florence.

Groups concerned with particular neurological illness research areas include:

Cerebral Circulation and Metabolism, *Drs. Fox, Grubb,*
Perlmutter, Powers, Raichle, Rich.

Convulsive Disorders, *Drs. Clifford, Dodson,*
Ferrendelli, Goldring, Miller, Snyder.

Demyelinating Diseases, *Drs. Agrawal, Trotter,*
Van der Veen.

Disorders of Movement, *Professor Clare, Drs. Landau,*
Montgomery, Perlmutter, Sabrmann, Schieber,
Thach.

Memory, Aging, and Dementia, *Drs. Berg, Botwinick,*
Coben, Ducheck, Morris, Raichle, Storandt.
Metabolic Diseases of Children, *Drs. Dodson, Noetzel,*
Prensky.

Areas of Neurosurgical specialization include:

Epilepsy Surgery, *Dr. Goldring.*

Pituitary Surgery, *Dr. Cox.*

Pain Surgery, *Dr. Jenny.*

Pediatric Neurosurgery, *Dr. Cox.*

Cerebrovascular Surgery, *Drs. Grubb, Rich.*

SECOND YEAR

Neurological Pathophysiology and Introduction to Clinical Neurology and Neurological Surgery

Lectures, demonstrations, and case conferences covering disease mechanisms.

Neurology-Neurosurgery Staff

Neurological Examination in Clinical Diagnosis (part of interdepartmental course in clinical diagnosis)

Lectures, demonstrations, and practice examinations of neurological patients. *Dr. Eliasson and Staff*

THIRD YEAR

Combined Neurology-Neurosurgical Clerkship

A full-time, four-week clerkship is provided on the neurology services at Barnes, St. Louis Regional Medical Center, and Jewish Hospital and on the Barnes Hospital neurosurgical service. Patients are assigned to students who follow them with the resident staff and discuss them regularly in conferences with the senior neurological and neurosurgical staff. Students also work in the neurology and neurosurgical clinics under staff supervision. *Drs. Eliasson, Landau, Goldring, and Staff*

FOURTH YEAR ELECTIVES

Research

A 6- to 12-week elective is available in many areas such as neuroanatomy, neurophysiology, cerebral metabolism and circulation, neurochemistry, neuropharmacology, etc. Facilities are available for qualified students in any year to undertake original research in the laboratories of the department or in the clinics and wards. *Drs. Goldring, Landau, and combined Neurology-Neurosurgery Staff*



Clinical Neurology Consult Neurology

A four-week elective is offered at Barnes Hospital. The student works directly with the consult resident and senior staff covering consultations at Barnes and Jewish Hospitals. Selected reading assignments on current topics in neurology. *Dr. Eliasson and Staff*

Clinical Neurosurgery

The goal of the six-week clerkship at Barnes Hospital is to provide an overview of neurological surgery. Responsibilities include patient workup, pre- and post-operative care, and attendance at selected neurosurgical operations. Daily teaching rounds are held with a member of the attending staff. Students also work in the Neurosurgical Clinic and attend the weekly staff conferences. *Dr. Goldring and Staff*

Staff Conferences

Students are invited to attend the Conjoint Neurological Conference (neuropathology, neuroradiology, medical neurology, pediatric neurology, and neurologic surgery) held on Wednesday at 1:30 p.m. in the West Pavilion Auditorium. Once each month the conference is held at the St. Louis Regional Medical Center. The format of the conferences includes clinical presentations, symposia, and CPCs. Neurosurgery Grand Rounds are held weekly at 7:15 a.m. on Wednesday in the Neurosurgery conference room, 511 McMillan Hospital. Dr. Eliasson conducts a rehabilitation conference in the rehabilitation satellite unit on 11400 Barnes at noon on Monday. Professor's rounds, dealing systematically with major problem areas of clinical neurology, are held at noon on Tuesday in the Barnes 11400 classroom. Professor's rounds in Neurosurgery are held at 8:00 a.m. on Saturday in the Neurosurgical ICU on 10400.

Faculty

Co-Heads of Department

Sidney Goldring, William Landau

NEUROLOGY

Andrew B. and Gretchen P. Jones
Professor of Neurology and Head

William M. Landau, M.D.,
Washington University, 1947.

Professor and Vice Chairman of
Neurology

Sven G. Eliasson, Ph.D., University
of Lund, 1952; M.D., 1954.

Seay Professor of Clinical
Neuropharmacology

James A. Ferrendelli, A.B.,
University of Colorado, 1958; M.D.,
1962. (See Departments of
Pharmacology and Ophthalmology,
and Neurological Surgery.)

Allen P. and Josephine B. Green
Professor of Pediatric Neurology

Arthur L. Pinsky, A.B., Cornell
University, 1951; M.D., New York
University, 1955. (See Department
of Pediatrics.)

A. Ernest and Jane G. Stein
Professor of Developmental
Neurology

Joseph J. Volpe, B.A., Bowdoin
College, 1960; M.D., Harvard
University, 1964. (See Departments
of Biological Chemistry and
Pediatrics.)

August A. Busch, Jr., Professor
Emeritus of Neurological Surgery
and Lecturer

Henry G. Schwartz, A.B., Princeton
University, 1928; M.D., Johns
Hopkins University, 1932.

Professors

Harish C. Agrawal
(Neurochemistry), B.Sc., Allahabad
University, 1957; M.Sc., 1959; Ph.D.,
1964. (See Departments of
Pathology and Pediatrics.)

Jack Botwinick (Psychology),
Ph.D., New York University, 1953;
M.A., Brooklyn College, 1950. (Also
Department of Psychology.)

Michael H. Brooke, M.B., B.Ch.,
Cambridge University, 1958. (See
Irene Walter Johnson Institute of
Rehabilitation.)

Ronald M. Burde, B.S.,
Massachusetts Institute of
Technology, 1960; M.D., Jefferson
Medical College, 1964. (See
Departments of Ophthalmology
and Neurological Surgery.)

Margaret H. Clare
(Neurophysiology), B.S.Ed.,
Southeast Missouri State Teachers
College, 1940; M.A., Washington
University, 1951.

W. Maxwell Cowan,
(Neurobiology), B.Sc.,
Witwatersrand University, 1951;
D.Phil., Oxford University, 1956;
M.B., B.Ch., 1958; M.A., 1959. (See
Neurological Surgery and
Administration.) (Also Department
of Biology.)

Philip R. Dodge, M.D., University
of Rochester, 1948. (See
Department of Pediatrics.)

W. Edwin Dodson, A.B., Duke
University, 1963; M.D., 1967. (See
Department of Pediatrics.)

Carlton C. Hunt
(Neurophysiology), B.A., Columbia
University, 1939; M.D., Cornell
University, 1942. (See Department
of Cell Biology and Physiology and
Neurological Surgery.)

Alan L. Pearlman, A.B., State
University of Iowa, 1958; M.D.,
Washington University, 1961. (See
Department of Cell Biology and
Physiology.)

Michael I. Posner
(Neuropsychology), B.S., University
of Washington, 1957; M.S., 1959;
Ph.D., University of Michigan, 1962.
(See Neurological Surgery.) (Also
Department of Psychology.)

Marcus E. Raichle, B.S., University
of Washington, 1960; M.D., 1964.
(See Department of Radiology.)
(Also School of Engineering and
Applied Science.)

Martha Storandt (Psychology),
A.B., Washington University, 1960;
Ph.D., 1966. (Also Department of
Psychology.)

W. Thomas Thach, Jr., A.B.,
Princeton University, 1959; M.D.,
Harvard University, 1964. (See
Department of Anatomy and
Neurobiology.)

Jean Holowach Thurston
(Neurochemistry), B.A., University
of Alberta, 1938; M.D., 1941. (See
Department of Pediatrics.)

Edward E. Vastola, B.S., Yale
University, 1945; M.D., Columbia
College of Physicians and
Surgeons, 1947. (St. Louis Regional
Medical Center.)

Thomas A. Woolsey
(Neuroscience), B.S., University of
Wisconsin, 1965; M.D., Johns
Hopkins University, 1969. (George
H. and Ethel R. Bishop Scholar in
Neuroscience in Neurology and
Neurological Surgery.) (See
Neurological Surgery and
Departments of Anatomy and
Neurobiology, and Cell Biology and
Physiology.)

Research Professor

Kenneth B. Larson (Biomedical
Computing), Met.E., Colorado
School of Mines, 1951; S.M.,
Massachusetts Institute of
Technology, 1958; Ph.D., 1964. (See
Institute for Biomedical
Computing.)

Professors (Clinical)

Leonard Berg, A.B., Washington
University, 1945; M.D., 1949.

Herbert E. Rosenbaum, B.S.,
University of Oregon, 1947; M.D.,
1949.

E. Robert Schultz, A.B., Southeast
Missouri State College, 1952; B.S.
Med., University of Missouri, 1953;
M.D., Washington University, 1955.
(See Department of Psychiatry.)

Stuart Weiss, A.B., Washington
University, 1950; M.D., 1954.

Associate Professors

Lawrence A. Coben, B.S., Western
Reserve University, 1948; M.D.,
1954; M.A., Northwestern
University, 1951. (Also Computer
Systems Laboratory.)

Ruthmary K. Deuel, B.A., Mount
Holyoke College, 1956; M.D.,
Columbia College of Physicians
and Surgeons, 1961. (See
Department of Pediatrics.)

Mary I. Johnson, B.S., Washington
State University, 1964; M.D., Johns
Hopkins University, 1968. (See
Departments of Anatomy and
Neurobiology and Pediatrics.)

Shirley A. Sahrman (Neurophysiology), B.S.P.T., Washington University, 1958; M.A., 1971; Ph.D., 1973. (See Department of Cell Biology and Physiology and Program in Physical Therapy.)

John L. Trotter, A.B., DePauw University, 1965; M.D., Washington University, 1969. (Gordon R. and Thelma B. Coates Scholar in Neurology.)

Research Associate Professor

Patti M. Nemeth (Myochemistry), B.S., University of Arizona, 1969; Ph.D., University of California, 1977. (See Department of Anatomy and Neurobiology.)

Associate Professors (Clinical)

Joseph T. Black, B.A., University of Rochester, 1961; M.D., State University of New York, Upstate, 1965.

Joseph M. Dooley, Jr., B.S., St. Louis University, 1954; M.D., 1958.

Richard S. Sohn, B.S., Brooklyn College, 1964; M.D., University of Chicago, 1968.

Assistant Professors

David B. Clifford, B.A., Southwestern University, 1971; M.D., Washington University, 1975. (Starkloff Hospital.)

Peter T. Fox, B.A., St. John's College, 1975; M.D., Georgetown University, 1979. (See Department of Radiology.)

John W. Miller, B.S., University of Chicago, 1973; M.D., University of Illinois, 1977.

Erwin B. Montgomery, Jr., B.S., State University of New York, Buffalo, 1972; M.D., 1976.

John C. Morris, B.A., Ohio Wesleyan University, 1970; M.D., University of Rochester, 1974.

Michael Noetzel, A.B., Yale, 1973; M.D., University of Virginia, 1977. (See Department of Pediatrics.)

Gary D. Paige, B.S., University of California-Irvine, 1974; Ph.D., University of Chicago, 1980; M.D., 1981. (See Departments of Ophthalmology and Otolaryngology.)

Joel S. Perlmutter, B.A., Princeton University, 1975; M.D., University of Missouri—Columbia, 1979. (See Department of Radiology.)

William J. Powers, A.B., Dartmouth College, 1971; M.D., Cornell University, 1975. (See Department of Radiology.) (Jewish Hospital.)

Steven M. Rothman, M.D., State University of New York, Upstate, 1969. (See Departments of Anatomy and Neurobiology and Pediatrics.)

Marc H. Schieber, A.B., Washington University, 1974; Ph.D., 1982; M.D., 1982. (See Department of Anatomy and Neurobiology.)

William D. Snider, B.S., University of North Carolina, 1971; M.D., University of North Carolina Medical School, 1977.

Abraham Zvi Snyder, A.B., Columbia College in the City of New York, 1970; Ph.D., The Rockefeller University, 1977; M.D., State University of New York at Buffalo, 1981.

Selden E. Spencer, B.A., Allegheny College, 1967; M.D., University of North Dakota, 1978.

Research Assistant Professors Emeriti

Joe Inukai (See Neurological Surgery.)

Lloyd N. Simpson (See Neurological Surgery.)

Research Assistant Professors

M. Carolyn Baum, B.S., University of Kansas, 1966; M.A., Webster College, 1979. (See Program in Occupational Therapy.)

Bruce A. Crosson, B.A., Southern Methodist University, 1972; M.A., 1974; Ph.D., Texas Tech University, 1978. (See Department of Psychiatry.)

Julaine Florence, B.S., Washington University, 1975; MHS, 1983.

Kenneth K. Kaiser, B.S., Colorado State University, 1968.

Dennis D. M. O'Leary (Neurobiology), B.S., University of Illinois-Urbana, 1976; Ph.D., Washington University, 1983. (See Department of Anatomy and Neurobiology and Neurological Surgery.)

Steven E. Petersen (Neuropsychology), B.A., University of Montana, 1974; Ph.D., California Institute of Technology, 1981. (See Neurological Surgery.)

Tom O. Videen (Neurophysiology), B.A., Carleton College, 1970; Ph.D., University of Washington, 1981. (See Department of Radiology.)

Ilene G. Wittels (Psychology), Ph.D., Washington University, 1971. (Also Department of Psychology.)

Assistant Professors (Clinical)

Garrett C. Burris, B.S., University of Southwestern Louisiana, 1964; M.D., 1968. (See Department of Pediatrics.)

Octavio de Marchena, A.B., Johns Hopkins University, 1972; M.D., 1976.

Richard J. Ferry, B.S., St. Louis University, 1958; M.D., 1962.

Joseph Hanaway, B.A., McGill University, 1956; M.D., 1960; C.M., 1960.

William B. Hardin, B.S., Rice University, 1953; M.D., University of Texas Medical School at Galveston, 1957.

J. Michael Hatlelid, B.A., St. John's University, 1970; M.D., Washington University, 1977.

Walter Lemann, B.S., Yale University, 1975; M.D., Tulane University, 1979.

Robert P. Margolis, B.S., Kent State University, 1971; M.D., St. Louis University, 1975.

David F. Mendelson, B.A., University of California, 1946; M.D., Indiana University, 1948.

David M. Reisler, A.B., Harvard University, 1957; M.D., Washington University, 1961; M.P.H., Johns Hopkins University, 1971.

James R. Rohrbaugh, B.A., Yale University, 1971; M.D., Ohio State University, 1974. (See Department of Pediatrics.)

Eli R. Shuter, A.B., Cornell University, 1956; M.D., Washington University, 1960.

Howard I. Weiss, M.D., Tulane University, 1972.

Research Instructors

Mary A. Coats, R.N., Barnes Hospital School of Nursing, 1971; B.S.N., Southern Illinois University-Edwardsville, 1980.

Emily LaBarge, A.B., Washington University, 1957; M.Ed., University of Missouri, 1980.

Instructors (Clinical)

John F. Mantovani, B.A., University of Evansville, 1971; M.D., University of Missouri, Columbia, 1974. (See Department of Pediatrics.)

Robert J. Mueller, M.D., Washington University, 1936; M.S., University of Michigan, 1942.

Karen J. Pentella, B.S., Ohio State University, 1976; M.D., 1979.

Daniel Phillips, B.A., Northwestern, 1976; M.D., Washington University, 1980.

Research Associate

Steven R. Buchholz (See Neurological Surgery.)

Research Assistants

David Yuen-Kai Chi, B.A., Greenville College, 1970; M.S., St. Louis University, 1976.

Dorothy Edwards, B.S., Loyola University, 1972; Ph.D., Washington University, 1980. (See Program in Occupational Therapy.)

Ann C. McKeon, B.S., Boston College, 1975.

JoAnne D. Scarpellini, B.S., Indiana State University, 1953.

Jeanne M. Smith (See Neurological Surgery.)

NEUROLOGICAL SURGERY

Professor and Head

Sidney Goldring, B.S., Washington University, 1943; M.D., 1947.

August A. Busch, Jr., Professor Emeritus and Lecturer

Henry G. Schwartz, A.B., Princeton University, 1928; M.D., Johns Hopkins University, 1932.

Professors

Ronald M. Burde, B.S., Massachusetts Institute of Technology, 1960; M.D., Jefferson Medical College, 1964. (See Neurology and Department of Ophthalmology.)

W. Maxwell Cowan, B.Sc., Witwatersrand University, 1951; D.Phil., Oxford University, 1956; M.B., B.Ch., 1958; M.A., 1959. (See Neurology and Administration.) (Also Department of Biology.)

William S. Cox, B.S., Hampden-Sydney College, 1945; M.D., Johns Hopkins University, 1948.

James A. Ferrendelli, A.B., University of Colorado, 1958; M.D., 1962. (See Neurology and Departments of Pharmacology and Ophthalmology.)

Mokhtar Gado, M.B., B.Ch., Cairo University, 1953; DMRE, 1960. (See Department of Radiology.)

Robert L. Grubb, Jr., A.B., University of North Carolina, 1961; M.D., 1965. (See Department of Radiology.)

Carlton C. Hunt, B.A., Columbia University, 1939; M.D., Cornell University, 1942. (See Department of Cell Biology and Physiology and Neurology.)

Michael I. Posner, B.S., University of Washington, 1957; M.S., 1959; Ph.D., University of Michigan, 1962. (See Neurology.) (Also Department of Psychology.)

Thomas A. Woolsey, B.S., University of Wisconsin, 1965; M.D., Johns Hopkins University, 1969. (Ethel R. and George H. Bishop Scholar in Neuroscience.) (See Neurology and Departments of Anatomy and Neurobiology and Cell Biology and Physiology.)

Assistant Professors

Andreas H. Burkhalter, B.S., University of Zurich, 1973; Ph.D., 1977. (See Department of Anatomy and Neurobiology.)

Arthur B. Jenny II, A.B., Johns Hopkins University, 1965; M.D., 1969; Ph.D., Washington University, 1980.

Dennis D.M. O'Leary, B.S., University of Illinois, 1976; Ph.D., Washington University, 1983. (See Department of Anatomy and Neurobiology and Neurology.)

Keith M. Rich, B.A., Taylor University, 1974; M.D., Indiana University, 1977.

Research Assistant Professor

Gary W. Harding, B.S., University of Washington, 1967; M.S.E., 1984.

Research Assistants

Isaac A. Edwards

Karl L. Probst

Jeanne M. Smith (See Neurology.)

**DEPARTMENT OF
OBSTETRICS AND
GYNECOLOGY**



OBSTETRICS AND GYNECOLOGY

The student's involvement in obstetrics and gynecology consists of a thorough exposure to the basic concepts in reproductive biology and an active participation in the delivery of medical care to women with gestations normal or at risk, congenital anomalies of pelvic viscera, structural disorders secondary to difficult childbirth, reproductive endocrinopathies and infertility, and gynecologic malignancies. The third-year clerkship is conducted at Barnes Hospital, Jewish Hospital, and St. Louis Regional Hospital, with the majority of the students stationed at Barnes. Fourth-year electives may be taken at Barnes Hospital or in the many affiliated hospitals in St. Louis. Regularly held conferences in reproductive biology, perinatal medicine, ob-gyn pathology, and oncology supplement the student's education.

SECOND YEAR

Second-year students are introduced to obstetrics and gynecology with lectures in reproductive biology which apply the pelvic anatomy and physiology taught in the first year, physiology of tubal transport and ovarian control, myometrial function, placental perfusion, steroidogenesis, genetics, and prenatal diagnosis.

THIRD YEAR

Students are assigned to a resident-staff team, and the residents and staff physicians serve as preceptors during the student's six-week stay in the department. Every woman seen in the office or cared for in the hospital by the team of physicians is considered in her entirety. Attention is paid to the manner in which her social and economic situation has modified her response to disease. Environmental manipulation, in addition to traditional medical care, is prescribed to improve her health. The team method ensures that personalized care is given by arranging for the same group of physicians to meet a woman's health needs during each visit. The residents in a team function like a group in obstetrics and gynecology practice, and the student works like an intern in the specialty. The student sees patients in the office with the resident group, attends deliveries, assists in surgery, goes to conferences, and takes night call with them as part of the team.

FOURTH YEAR

Fourth-year students wishing to take an externship or research elective can choose from a variety of courses:

Ob-Gyn Subinternships

(A) Endocrinology Infertility Subinternship. In the office and hospital, the extern participates in the study and treatment of women with reproductive endocrine disorders and infertility. The extern presents patients in conferences, has assigned reading, and obtains experience in the techniques of steroid and gonadotro-

pin quantitation as well as various manipulative procedures. *Dr. Warren*

(B) Pathology Subinternship. The elective elucidates the principles of anatomic pathology as applied to operative material in obstetrics and gynecology. The extern examines gross and microscopic specimens in the Ob-Gyn Pathology Laboratory and reviews pertinent literature with a senior pathologist. *Dr. Gersell*

(C) Gyn Oncology Subinternship. This elective concerns itself with the diagnosis and treatment of malignant tumors of the female reproductive tract. The extern is involved in all aspects of the care of women with gyn malignant tumors. This experience will include the surgical treatment, radiation therapy, and chemotherapy. *Dr. Camel*

(D) Perinatal Medicine Subinternship. Electronic and biochemical surveillance of the human fetus and mother before and during parturition. The extern is involved in the care of women with gestations at risk (i.e., diabetes, hypertension, toxemia, renal disease, fetopelvic disproportion, etc.). *Dr. Petrie*

(E) Ob-Gyn Preceptorship. Students who participate in this preceptorship spend six weeks with a clinical faculty member who is in private practice. They make hospital rounds and operate with their preceptors at Barnes and other community hospitals. The student becomes familiar with the experiences of the private practitioner. *Dr. Warren*

(F) Endocrinologic Function and Disease During Pregnancy Subinternship. While on elective, the student will participate in clinical and/or research activities leading to a basic understanding of the endocrinology of pregnancy and endocrine dysfunction during pregnancy. The student will present patients in conferences, have assigned reading, and obtain experience in clinical research techniques. *Dr. Rigg*





(G) **Obstetric Anesthesiology.** In this clinical elective, students receive instruction in the fundamentals of obstetric pain relief and newborn infant management and resuscitation. The pharmacology of sedatives, tranquilizers, narcotics, local anesthetics, inhalation, and intravenous drugs is demonstrated by practical application, emphasizing fetal-maternal implications in the management of labor. Special local anesthetic blocks such as caudal, lumbar epidural, and saddle spinal. Experience is also gained in the management of general anesthesia for minor gynecologic procedures such as postpartum tubal ligations.

Anesthesia Staff

(H) **General Ob-Gyn Subinternships.** St. Louis Regional Medical Center. The externship in this affiliated hospital allows the student a greater degree of participation and responsibility in the care of patients. There is a wealth of clinical material in this facility.

Drs. Sauvage, Kivikoski

Research Electives

(A) **Molecular Aspects of Endocrinology and Population Control.** The research involves the study of the topography of macromolecular steroid binding sites, evaluation of the role of steroid "receptor" proteins in molecular mechanisms of steroid action, and the synthesis of affinity-labeling steroids and anti-steroids and their application to disease states and population control. *Dr. Warren*

(B) **Regulation of Placental Hormone Synthesis.** The laboratory is concerned with studying the factors regulating the biosynthesis of protein hormones in the

placenta, human placental lactogen (hPL), and human chorionic gonadotropin (hCG). The appearance of these hormones in maternal serum differs markedly. For these studies the template mRNAs have been isolated and we are generating complementary DNAs to the corresponding mRNAs. These DNA probes will be used to assay gene activities in normal and pathological tissues. Students will be concerned with the concepts and techniques of molecular biology as applied to the above research. *Dr. Boime*

(C) **Sperm Biochemistry and Andrology.** Research is performed which is aimed at the understanding and control of the molecular events which allow for sperm penetration of the ovum. Investigations into male infertility centering on sperm motility, bacteriological considerations, and freezing of semen are also conducted. *Dr. Polakoski*

(D) **Bio-Organic Chemical Endocrinology.** The mechanism of steroid hormone action at the molecular level is approached by producing new progesterone and estrogen analogs by organic synthesis. The student can work at the organic synthetic or biochemical level. Isolation of uterine estrogen and progesterone receptor proteins by a newly synthesized affinity chromatography system is in progress. Also, new steroids containing alkylating functional groups are synthesized and have a dual research role: to serve as tools with which to probe the steroid-macromolecular binding phenomenon and to produce biologically active steroids with persistent hormone activity or hormone blocking action. Physicochemical methods are used to study steroid-protein interaction. *Dr. Sweet*

(E) Cell Biology and Immunology. The research involves the *in vitro* and *in vivo* analysis of tumor cells with particular emphasis on the relationship between the host immune system and the growth of tumorigenic cells. Two systems are currently used to facilitate this analysis. A mouse model system in which tumorigenic cells are induced by chemical car-

cinogens and a human system in which tumors, derived from patients, are established as cell lines *in vitro*. A variety of immunological and biological techniques are utilized and the student is encouraged to participate in ongoing research as well as to understand the conceptual framework on which the research is based. *Dr. Collins*

Faculty

Professor and Head of Department

James C. Warren, A.B., University of Wichita, 1950; M.D., University of Kansas, 1954; Ph.D., University of Nebraska, 1961. (See Department of Biological Chemistry.)

Professors Emeriti

Willard M. Allen, B.S., Hobart College, 1926; M.S., University of Rochester, 1929; M.D., 1932; Sc.D. (hon.), Hobart College, 1940; Sc.D. (hon.), University of Rochester, 1957.

Walter G. Wiest, A.B., Brigham Young University, 1948; Ph.D., University of Wisconsin, 1952. (See Department of Biological Chemistry.)

Professors

Irving Boime, B.S., St. Louis College of Pharmacy, 1964; M.S., Purdue University, 1966; Ph.D., Washington University, 1970. (See Department of Pharmacology.)

H. Marvin Camel, M.D., Creighton University, 1950.

James P. Crane, A.B., Indiana University, 1966; M.D., 1970. (See Department of Genetics.)

Ernst R. Friedrich, M.B., University of Berlin, 1951; M.D., University of Heidelberg, 1954.

Ming-Shian Kao, M.D., National Taiwan University Medical College, 1961.

Roy H. Petrie, B.S., Western Kentucky University, 1958; M.D., Vanderbilt University, 1965. Sc.D., Columbia University, 1984.

Kenneth V. Polakoski, B.S., Wisconsin State University, 1966; M.S., University of Georgia, 1971; Ph.D., 1972.

Ronald C. Strickler, B.S., University of Toronto, 1963; M.D., 1967.

Frederick Sweet, B.S., City University of New York, 1960; Ph.D., University of Alberta, 1968.

Professors Emeriti (Clinical)

A. Norman Arneson, B.S., Texas Christian University, 1924; M.D., Washington University, 1928. (See Department of Radiology.)

John E. Hobbs, A.B., Southwest Missouri State Teachers College, 1923; M.D., Washington University, 1927.

Frank B. Long, Jr., M.D., Washington University, 1947.

Melvin A. Roblee, B.S., Washington University, 1923; M.D., 1925.

Professors (Clinical)

Robert Burstein, M.D., Washington University, 1948.

William H. Masters, B.S., Hamilton College, 1938; M.D., University of Rochester, 1943.

Associate Professor Emeritus

George J. L. Wulff, Jr., A.B., Washington University, 1929; M.D., 1933.

Associate Professor Emeritus (Clinical)

James Pennoyer, B.S., Hobart College, 1933; M.D., University of Rochester, 1939.

Associate Professor

Jacques Sauvage, B.S., University of Liege, 1953; M.D., 1957.

Associate Professors (Clinical)

S. Michael Freiman, A.B., Montana State University, 1951; M.D., Washington University, 1955.

Andrew E. Galakatos, B.S., St. Louis College of Pharmacy, 1960; M.D., University of Missouri, 1965.

Robert S. Goell, A.B., Middlebury College, 1949; A.M., University of Pennsylvania, 1950; M.D., Washington University, 1960.

J. Barlow Martin, B.A., Amherst College, 1951; M.D., Washington University, 1955.

Norman K. Muschany, A.B., Westminster College, 1947; M.D., Temple University, 1951.

Marvin Rennard, A.B., Washington University, 1947; B.S., University of Missouri, 1950; M.S., 1950; M.D., Washington University, 1952.

Melvin M. Schwartz, A.B., University of Nebraska, 1945; M.D., 1947.

Eugene D. Taylor, B.S., Virginia State College, 1948; M.D., Howard University, 1954.

Assistant Professors

Erol Amon, B.A., University of Illinois, 1976; M.D., Northwestern University, 1979.

Michael J. Gast, B.S., University of Illinois, 1970; M.D., Ohio State University, 1973; Ph.D., Washington University, 1981.

Asko I. Kivikoski, B.M., University of Helsinki, 1954; M.D., University of Turku, 1958; D.Sc., 1967.

Carolyn M. Martin, B.A., Lindenwood College, 1970; M.D., Washington University, 1976.

David G. Mutch, B.A., Carleton College, 1976; M.D., Washington University, 1980.

D. Michael Nelson, B.A., Cornell College, 1971; M.D., Washington University, 1977; Ph.D., 1977.



Michael J. Paul, B.S., Northwestern University, 1978; M.D., 1980.

Jorge Pineda, B.S., University of Honduras, 1964; M.D., 1972.

Giuliana S. Songster, B.A., University of California-Berkeley, 1971; M.D., University of Utah, 1980.

Research Assistant Professors

Sau Wai Cheung, B.S., New Asia College, 1966; M.S., University of Louisville, 1969; Ph.D., Indiana University, 1975.

John L. Collins, B.S., University of Tennessee, 1971; Ph.D., 1976.

Gary L. Murdock, B.S., University of Iowa, 1971; Ph.D., Medical University of South Carolina, 1976.

Assistant Professors Emeriti (Clinical)

William Berman, A.B., Washington University, 1931; M.D., 1935.

Arthur R. Bortnick, M.D., Washington University, 1935.

Arthur T. Esslinger, M.D., Washington University, 1940.

Willard C. Scrivner, B.S., Washington University, 1926; M.D., 1930.

Helman C. Wasserman, A.B., Johns Hopkins University, 1928; M.D., Washington University, 1932.

Assistant Professors (Clinical)

Robert L. Becker, B.A., Cornell University, 1965; M.D., Washington University, 1969.

Bruce L. Bryan, B.S.M.E., Purdue University, 1973; M.D., Washington University, 1977.

Robert S. Cohen, B.S., Union College, 1958; M.D., State University of New York, 1962.

C. Richard Gulick, B.A., Westminster College, 1966; M.D., University of Rochester, 1971.

Richard A. Hartman, B.S., Massachusetts Institute of Technology, 1974; M.D., University of Missouri, 1978.

Randall L. Heller, Jr., B.S., University of Missouri, 1964; Ph.D., 1968; M.D., University of Texas, 1976.

William L. Holcomb, Jr., B.S., Purdue University, 1970; M.D., Indiana University, 1975.

Darwin C. Jackson, B.S., Ohio State University, 1972; M.D., Washington University, 1976.

Jacob Klein, B.S., Muhlenberg College, 1964; M.D., Jefferson Medical College, 1968.

David J. Levine, B.A., Rutgers College, 1972; M.D., Autonomous University of Guadalajara, 1976.

Jonathan R. Reed, B.A., Fisk University, 1956; M.D., Meharry Medical College, 1965.

Lee A. Rigg, B.A., Arizona State University, 1961; Ph.D., University of Colorado, 1965; M.D., Washington University, 1971.

Chotchai Srisuro, M.D., Faculty of Medical Sciences, 1967.

M. Bryant Thompson, A.B., Eastern New Mexico University, 1957; M.D., University of California, 1961.

Albro C. Tobey, B.S., Butler University, 1965; M.D., Trinity College, University of Dublin, 1972.

J. Leslie Walker, B.A., Vanderbilt University, 1957; M.D., University of Tennessee, 1960.

Instructors

Diana L. Gray, B.S., University of Illinois, 1977; M.D., 1981.

Diane E. Merritt, A.B., Miami University, 1971; M.D., New York University, 1976.

Casey C. Younkin, B.A., Johns Hopkins University, 1979; M.D., Washington University, 1983.

Instructors (Clinical)

Scott R. Barrett, Jr., M.D., Howard University, 1975.

James E. Belcher, B.S., Texas University, 1972; M.D., Washington University, 1976.

Joe E. Belew, A.B., Central College, 1953; M.D., St. Louis University, 1957.

Charles W. Butrick, B.S., Kansas State University, 1977; M.D., Kansas University, 1980.

Shih-Chung Chang, M.D., Chung-Shan Medical College, 1968.

Christine M. Cherry, B.A., Knox College, 1978; M.D., Rush University, 1983.

Ronald J. Chod, B.A., University of Texas-Austin, 1978; M.D., University of Texas-Dallas, 1983.

Lauren E. Clark-Rice, A.B., University of California, 1973; M.D., University of Missouri, 1977.

David E. Dugger, B.E., Vanderbilt University, 1972; M.D., 1976.

Cathleen R. Faris, B.A., University of Kansas, 1977; M.D., 1982.

Ira C. Gall, B.S., University of Cincinnati, 1948; M.D., 1951.

Joseph Hazan, M.D., Ege University Medical School, 1971.

Godofredo M. Herzog, B.S., Louisiana State University, 1953; M.D., Washington University, 1957.

William E. Houck, B.S., Brown University, 1977; M.D., University of Cincinnati, 1981.

Michael K. Johnson, B.S., Ohio State University, 1970; M.D., St. Louis University, 1975.

Mark J. Jostes, B.S., Rockhurst College, 1976; M.D., University of Missouri, Columbia, 1981.

James W. Kessel, M.D., University of Chicago, 1975; Ph.D., California Institute of Technology, 1963.

Justin E. Kraner, M.D., University of Michigan, 1949.

Darryl H. McKinney, B.A., Yale University, 1976; M.D., Washington University, 1980.

Clifford G. Martin, B.S., University of Montana, 1978; M.D., Tulane University, 1982.

Theodore M. Meiners, M.D., Washington University, 1948.

Theodore Merrims, A.B., Washington University, 1949; M.D., 1954.

Jerry N. Middleton, B.A., Westminster College, 1959; M.D., Washington University, 1963.

Casey A. Moauro, B.S., University of Illinois, 1977; M.D., 1981.

Sam Momtazee, M.D., Shiraz Medical School, 1961.

Vivian E. Moynihan, B.S., University of Dayton, 1977; M.D., Ohio State University, 1980.

Nathaniel H. Murdock, B.S., Harvard University, 1958; M.D., Meharry Medical College, 1963.

Gerald Newport, A.B., Washington University, 1948; M.D., 1953.

Joseph D. O'Keefe, A.B., University of Colorado, 1946; M.D., Washington University, 1950.

James C. Ottolini, B.A., Southern Illinois University, 1961; M.D., St. Louis University, 1965.

Carlton S. Pearce, B.S., University of Colorado, 1973; M.D., Washington University, 1978.

Louis T. Riley, B.A., Earlham College, 1975; M.D., University of Kentucky, 1980.

Chinda Vanasin Rojanasathit, M.D., Siriraj Medical School, 1967.

Jerome D. Sachar, B.A., Amherst College, 1975; M.D., University of Missouri, Columbia, 1979.

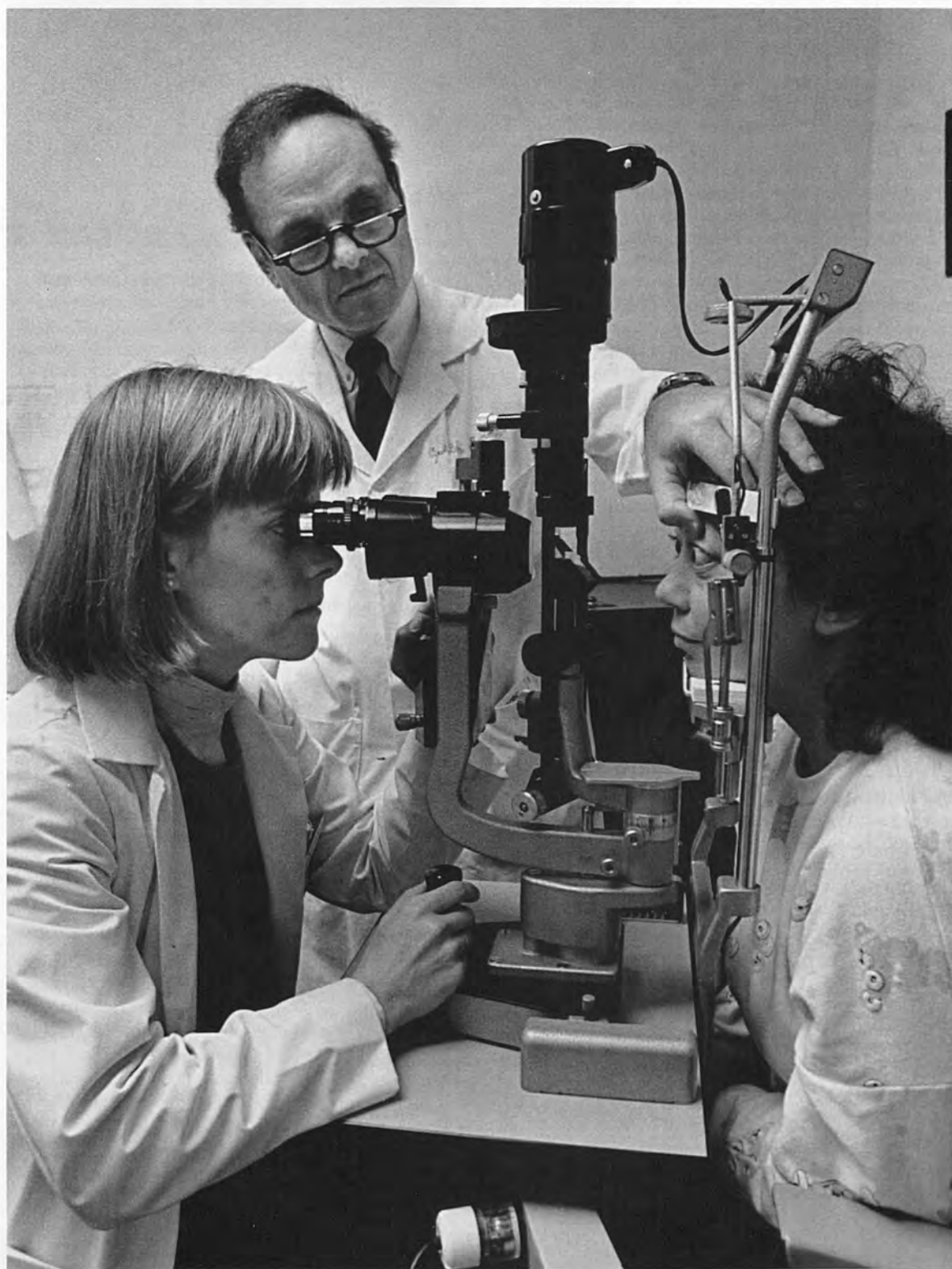
Alan S. Wasserman, B.A., University of Missouri, Kansas City, 1979; M.D., 1979.

Gary M. Wasserman, B.A., University of Missouri at Kansas City, 1980; M.D., 1980.

Parker H. Word, B.S., Virginia State College, 1941; M.D., Howard Medical School, 1944.

Mitchell Yanow, M.D., Washington University, 1941.

DEPARTMENT OF OPHTHALMOLOGY



OPHTHALMOLOGY

Instruction begins in the second year with methods of examination of the eye. Emphasis is on the use of the ophthalmoscope. There are also several lectures on various aspects of ocular disease. During the third year, students are assigned to an ophthalmology clerkship for one week. In the fourth year, six-week and twelve-week clinical or research electives are offered.

SECOND YEAR

Introduction to clinical ophthalmology begins in the second year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on the use of the ophthalmoscope. Additionally, during the second year, there is a series of lectures on various aspects of ocular disease. The emphasis is on ocular manifestations of common systemic diseases, e.g. diabetic retinopathy, hypertensive retinopathy, optic neuritis, papilledema, Grave's ophthalmopathy, etc., as well as common eye diseases, e.g. cataracts and glaucoma. This series of lectures is presented as case problems on which students work prior to the lecture. This "problem-solving" approach has proven to be more successful and more informative than the strict didactic lecture approach.

Dr. M. Smith and Staff

THIRD YEAR

In the third year, all students (six at a time) spend one week in the outpatient eye clinic examining patients with ophthalmology residents. During this week, the students have discussion sessions on various topics with members of the faculty, e.g. differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, how to handle an ocular emergency in the emergency room (chemical burns, etc.). During this one week, there is again emphasis on the use of the ophthalmoscope, and a problem solving case history-photo album is worked on by the students.

Dr. M. Smith and Staff

FOURTH YEAR ELECTIVE

The fourth year is a clinical clerkship geared to the student who plans to enter the specialty of ophthalmology. The student's role is that of an extern in that he/she performs the history and ocular exam on patients in the outpatient clinic and/or the various services within the department, e.g. University Eye Service, glaucoma unit, neuroophthalmology unit, etc. The



student is expected to present cases at rounds and conferences. There are one or two students on each of these services for six or twelve weeks. *Dr. M. Smith and Staff*

RESEARCH ELECTIVES

Experimental research in visual physiology.

Dr. Brown

Experimental neuropathology. *Dr. R. Burde*

Experimental research in anatomy and physiology.

Dr. Cohen

Research in external diseases. *Dr. Gans*

Computer application in visual fields. *Dr. W. Hart*

Experimental and clinical research in glaucoma.

Dr. Kass

Experimental research in visual physiology.

Dr. R. Miller

Experimental research in ocular physiology.

Dr. Moses

Experimental and diagnostic ophthalmic pathology.

Dr. M. Smith

Research in cornea and diabetes. *Dr. Waltman*

Faculty

Professor and Head of Department

Bernard Becker, A.B., Princeton University, 1941; M.D., Harvard University, 1944.

Professor Emeritus

Robert A. Moses, A.B., Johns Hopkins University, 1938; M.D., University of Maryland, 1942.

Professors

Joel E. Brown, B.S., M.S., Massachusetts Institute of Technology, 1960; Ph.D., 1964. (See Departments of Cell Biology and Physiology and Anatomy and Neurobiology.)

Ronald M. Burde, B.S., Massachusetts Institute of Technology, 1960; M.D., Jefferson Medical College, 1964. (See Department of Neurology and Neurological Surgery.)

Adolph I. Cohen, B.S., City College of New York, 1948; M.A., Columbia University, 1950; Ph.D., 1954. (See Department of Anatomy and Neurobiology.)

Nigel W. Daw, B.A., Trinity College, 1956; M.A., 1961; Ph.D., Johns Hopkins University, 1967. (See Department of Cell Biology and Physiology.)

James A. Ferrendelli, A.B., University of Colorado, 1958; M.D., 1962. (See Departments of Pharmacology and Neurology and Neurological Surgery.)

William M. Hart, Jr., Ph.D., University of Maryland, 1970; M.D., 1970.

Michael A. Kass, B.S., Northwestern University, 1966; M.D., 1966.

Allan E. Kolker, A.B., Washington University, 1954; M.D., 1957.

Elsie F. Meyers, B.A., Indiana University, 1947; M.D., 1950. (See Department of Anesthesiology.)

Robert F. Miller, M.D., University of Utah, 1967. (See Departments of Anatomy and Neurobiology and Cell Biology and Physiology.)

Morton E. Smith, B.S., University of Maryland, 1956; M.D., 1960. (See Department of Pathology.)

Stephen R. Waltman, B.S., Massachusetts Institute of Technology, 1961; M.D., Yale University, 1964.

Professors (Clinical)

Robert C. Drews, A.B., Washington University, 1952; M.D., 1955.

Benjamin Milder, M.D., Washington University, 1939.

James E. Miller, B.S., Tulane University, 1946; M.D., Medical College of Alabama, 1949. (See Department of Pediatrics.)

Edward Okun, B.S., Dartmouth College, 1952; M.D., University of Vermont, 1956.

Associate Professors

Emeriti (Clinical)

Howard R. Hildreth, M.D., Washington University, 1928.

Theodore E. Sanders, B.S., University of Nebraska, 1931; M.D., 1933.

Associate Professors (Clinical)

George M. Bohigian, A.B., Washington University, 1961; M.D., St. Louis University, 1965.

Isaac Boniuk, B.S., Dalhousie University, 1958; M.D., 1962.

Jack Hartstein, B.S., University of Missouri, 1953; M.D., University of Cincinnati, 1955.

Glen P. Johnston, A.B., Washington University, 1953; M.D., 1956.

Jack Kayes, B.A., Yale University, 1953; M.D., Washington University, 1957.

Terence G. Klingele, M.D., University of California, 1970.

Harry D. Rosenbaum, M.D., Washington University, 1934.

Bernd Silver, B.S., University of Louisville, 1952; M.D., 1956.

Assistant Professors

Fred C. Chu, A.B., Princeton, 1967; M.D., Cornell, 1971. (See Department of Pediatrics.)

Lawrence A. Gans, B.A., Columbia University, 1972; M.D., Case Western Reserve University, 1977.

Melvin Haber, B.S., Rutgers University, 1956; M.D., New York Medical College, 1963. (See Department of Anesthesiology.)

Gary D. Paige, B.S., University of California, Irvine, 1974; Ph.D., University of Chicago, 1980; M.D., 1981. (See Departments of Neurology and Neurological Surgery and Otolaryngology.)

Research Assistant Professors

Christine Blazynski, B.S., University of Scranton, 1976; Ph.D., Purdue University, 1981.

Mae E. Gordon, B.A., Portland State University, 1967; M.S., University of Wisconsin, 1970; Ph.D., 1978. (See Division of Biostatistics.)

Stuart C. Mangel, B.A., Columbia University, 1973; M.A., University of Oregon, 1976; Ph.D., University of Virginia, 1981.

Peter Reinach, B.S., New York University, 1964; Ph.D., 1972.

Gary L. Trick, B.A., University of Miami, 1974; Ph.D., Indiana University, 1978.

Assistant Professors Emeriti (Clinical)

Edmund B. Alvis, M.D., Washington University, 1934.

Daniel Bisno, B.A., University of Wisconsin, 1927; M.D., Johns Hopkins University, 1931.

William H. Meinberg, B.S., Washington University, 1932; M.D., 1932.

Lawrence T. Post, Jr., M.D., Washington University, 1948.

Assistant Professors (Clinical)

Neva P. Arribas, M.D., Manila Central University, 1954.

Stanley C. Becker, A.B., Washington University, 1948; M.A., 1950; Ph.D., 1951; M.D., Chicago Medical School, 1955.

Edward F. Berg, A.B., Washington University, 1960; M.D., 1964.

Ronald C. Bilchik, B.S., University of Toledo, 1963; M.D., Washington University, 1967.

James C. Bobrow, B.A., Yale University, 1966; M.D., Johns Hopkins University, 1970.

Dean B. Burgess, A.B., Occidental College, 1963; M.D., University of California, 1967.

Samuel A. Canaan, Jr., A.B., State University of Iowa, 1942; M.A., Columbia University, 1948; M.D., Meharry Medical College, 1954.

Richard F. Escoffery, M.B., B.S., University of West Indies Medical School, 1969.

Robert M. Feibel, A.B., Johns Hopkins University, 1965; M.D., Harvard University, 1969.

James M. Gordon, B.A., University of Minnesota, 1962; M.D., 1966.

M. Gilbert Grand, B.S., Tufts University, 1964; M.D., Yale University, 1968.

Michael J. Isserman, A.B., Harvard University, 1971; M.D., Washington University, 1975.

Stephen A. Kamenetzky, A.B., Washington University, 1967; M.D., 1970.

Harry L. Knopf, A.B., Harvard University, 1963; M.D., Harvard Medical School, 1967.

Robert L. Lamberg, B.S., University of Missouri, St. Louis, 1972; M.D., Washington University, 1976.

Barry D. Milder, B.S., Massachusetts Institute of Technology, 1969; M.D., Washington University, 1973.

Matthew Newman, A.B., Vanderbilt University, 1956; M.D., Columbia University, 1959.

Robert Joseph Olk, A.B., Johns Hopkins University, 1969; M.L.A., 1971; M.D., Rush Medical College, 1975.

E. Thomas Ott, B.A., Southern Methodist University, 1963; M.D., Washington University, 1965.

Lawrence H. Schoch, B.Ch.E., University of Louisville, 1972; M.D., 1976.

Philip T. Shahan, A.B., Harvard College, 1938; M.D., Washington University, 1942.

Arthur W. Stickle, Jr., M.D., University of Oklahoma, 1943.

Philip Venable, B.S., Wayne State University, 1935; M.D., 1940.

William L. Walter, B.A., DePauw University, 1950; M.D., Ohio State University, 1954.

Charles E. Windsor, A.B., Carleton College, 1956; M.D., University of Rochester, 1960.

Mitchel L. Wolf, B.A., Yeshiva College, 1964; M.D., Albert Einstein College of Medicine, 1968.

Instructors

Scott W. Cousins, A.B., Dartmouth College, 1977; M.D., Case Western Reserve, 1982.

Joseph J. Parelman, M.D., Duke University, 1982.

Research Instructors

Gillian Roper-Hall, D.B.O., Moorfield Eye Hospital, 1966; D.B.O.(D), 1969; Certified Orthoptist, U.S. Board, 1973.

Leona J. Rubin, B.A., Temple University, 1972; M.S., Rutgers University, 1977; Ph.D., University of Colorado, 1982.

Instructor Emeritus (Clinical)

Maxwell Rachlin, M.D., University of Toronto, 1942.

Instructors (Clinical)

Nevinkumar J. Amin, I.S.C., Bombay University, 1960; M.B.B.S., 1966.

Bruce H. Cohen, A.B., Harvard College, 1976; M.D., Johns Hopkins Medical School, 1980.

Philip L. Custer, B.S., Vanderbilt University, 1974; M.D., 1978.

Janice E. Eggert, B.A., University of Michigan, 1970; M.A., 1971; M.D., University of Missouri, 1981.

Bruce S. Frank, S.B., Massachusetts Institute of Technology, 1972; M.D., Washington University, 1976.

Ruth S. Freedman, A.B., Washington University, 1938; M.D., 1942.

Kenneth O. Green, B.A., St. Louis University, 1956; M.D., University of Missouri, 1960.

Sidney J. Hanish, B.A., University of North Dakota, 1969; M.L.A., 1971; M.D., Rush Medical College, 1975.

William S. Joffe, A.B., Washington University, 1959; M.D., 1963.

Cynthia Z. Kenneally, A.B., University of Missouri, Columbia, 1976; M.A., 1978; M.D., 1982.

John C. Perlmutter, B.A., Queens College, 1967; M.D., Cornell University Medical College, 1971.

Michael B. Rumelt, B.S., Lamar State College of Technology, 1962; M.D., Washington University, 1966.

Mickey L. Salmon, M.D., Louisiana State University, 1959.

Mark H. Spurrier, B.A., Kansas State University, 1976; M.D., Washington University, 1980.

Stephen A. Wexler, B.S., University of Michigan, 1977; M.D., 1982.

Assistants

Clemens H. Jacques, B.S., University of California, 1949; O.D., 1949. (See Medical Care Group.)

Duane L. Mitzel, B.S., University of California, 1972; M.D., Washington University, 1977.

Louis J. Rosenbaum, B.A., University of Michigan; M.D., Washington University, 1963.

Research Assistants

Dorothy G. Cooper, R.N., Washington University, 1953; B.S.N., 1964; M.S.N., 1966.

Nels J. Holmberg, B.S., Oklahoma State University, 1963; M.S., 1966.

Floyce A. Scherrer, R.N., Washington University, 1960.

DEPARTMENT OF OTOLARYNGOLOGY



OTOLARYNGOLOGY

Otolaryngology is presented to students in the Second, Third, and Fourth Year Classes. A clinical pathologic correlation lecture series is presented to sophomores. In the third year of the medical curriculum, each student spends one week on one of the services in East Pavilion or St. Louis Veterans Administration. During this period there is teaching at the bedside, in the operating room, and in the clinic, supplemented by daily afternoon lectures, grand rounds on Wednesdays, and an introduction to audiology as well as to basic ENT research.

Fourth-year students who show a special interest may take a rotating elective in ENT suited to their interests. Some possibilities include research or clinical work. Ample research facilities and ongoing projects are available. Clinical exposure could include otologic diseases related to the head and neck, otologic diseases, otoneurology, audiology, or middle-ear surgery.

SECOND YEAR

Otolaryngology and Physical Diagnosis

Clinical pathologic correlative lectures in otolaryngology are given to the entire class. *Dr. Thawley*

THIRD YEAR

Otolaryngology Clerkship

Practical instruction in diagnosis and treatment. One week. *Dr. Thawley*

FOURTH YEAR ELECTIVES

Clinical Clerkship in Otolaryngology

Six week rotation includes evaluation of ENT problems presented to specialist for diagnosis and treatment. The student participates in the clinic, hospital and operating room. This also includes time on the Pediatric ENT Service, Audiology Voice Laboratory and Vestibular Evaluation Laboratory. Two students are accepted for each rotation. Students may select multiple options. *Dr. Thawley*

Practicum in Clinical Audiology

Guidance provided in the administration and interpretation of audiometric tests. Emphasis on defining the severity of auditory dysfunction in addition to identifying sites of pathological processes. Theoretical bases of acoustics, anatomy and physiology, and electronics reviewed as they relate to auditory assessment. Modification of conventional test paradigms and hearing aid procedures covered according to each student's interests and needs. *Dr. Skinner*

Otoneurology

Attend Audiology Lab Tuesday and Thursday mornings. Attend Otoneurology Lab on Tuesday and Thursday afternoons. The student will follow through on patients (in the office and hospital) who are complaining of dysequilibrium or vertigo. *Drs. Goebel, Paige*



RESEARCH ELECTIVES

Inner ear microanatomy and pathology (light- and electron-microscopy). The effects of various ototraumatic agents (e.g., noise, radiation, etc.) on the structure of the inner ear are determined using light and electron microscopic evaluation of the cochlear tissues. *Dr. Bohme*

Topics in microvascular surgery.

Drs. Hayden, Fredrickson

Glass microelectrodes, intra- and extra-cellular labels, computers, light and electronmicroscopy are used to study aspects of the central and peripheral vestibular system with an emphasis on vestibular efferents in anesthetized and alert fish and squirrel monkeys.

Dr. Highstein

Investigation of the ion and water transport properties of the inner ear at the tissue and cellular level. Focus is on the non-sensory (dark and clear) cells of the utricle and on the semicircular canal. Electrophysiological and chemical techniques are used. *Dr. Marcus*

Evaluation and treatment methods for disorders of the velopharynx and larynx in children.

Drs. Muntz, D'Antonio

Clinical laboratory diagnosis and research into normal and non-normal speech with special emphasis on voice disorders. Students will become familiar with diagnostic procedures and instrumental techniques.

Dr. Painter

Computer based studies of head and neck cancer treatment and results. *Dr. Sessions*

Research in implantable hearing aids.

Drs. Skinner, Fredrickson

Current projects involve patch clamp recording technology and single channel analysis to study efferent control of the vestibular hair cell. Computer data acquisition and analysis. *Dr. Steinacker*

Extensive research regarding the clinical evaluation of disorders of the inner ear. The student will be actively performing clinical tests for vestibular function including electronystagmography and audiology.

Drs. Stroud, P. Smith

Biochemistry and pharmacology of the inner ear. *Dr. Thalmann*

Faculty

Lindburg Professor and Head of Department

John M. Fredrickson, B.A., University of British Columbia, 1953; M.D., 1957; FRCS(C), 1963; M.D. (hon.), Sweden, 1975.

Professors

Stephen M. Highstein, B.S., Rensselaer Polytechnic Institute, 1961; M.D., University of Maryland Medical School, 1965; Ph.D., University of Tokyo Faculty of Medicine, 1976. (See Department of Anatomy and Neurobiology.)

Colin Painter, B.A., University of London, England, 1958; Ph.D., 1969.

Donald G. Sessions, A.B., Princeton University, 1958; M.D., Washington University, 1962.

Gershon J. Spector, A.B., Johns Hopkins University, 1960; M.D., University of Maryland, 1964.

Malcolm H. Stroud, M.D., Ch.B., University of Birmingham, 1945; L.R.C.P., M.R.C.S., 1946; F.R.C.S., 1949.

Ruediger Thalmann, M.D., University of Vienna, 1954.

Research Professor Emeritus and Lecturer

Hallowell Davis, A.B., Harvard University, 1918; M.D., 1922; Sc.D. (hon.), Colby College, 1954; Sc.D. (hon.), Northwestern University, 1962; Sc.D. (hon.), Washington University, 1973. (See Department of Cell Biology and Physiology.) (Also Central Institute for the Deaf.)

Professor Emeritus

S. Richard Silverman (Audiology), A.B., Cornell University, 1933; M.S., Washington University, 1938; Ph.D., 1942. (Also Central Institute for the Deaf and Faculty of Arts and Sciences.)

Research Professors

Donald H. Eldridge, S.B., Harvard University, 1943; M.D., 1946. (Also Central Institute for the Deaf and Faculty of Arts and Sciences.)

Ira J. Hirsh (Audiology), New York State College for Teachers (Albany), 1942; M.A., Northwestern University, 1943; M.A., Harvard University, 1947; Ph.D., 1948. (Also Central Institute for the Deaf and Faculty of Arts and Sciences.)

James D. Miller, B.S., University of Wisconsin, 1951; M.A., Indiana University, 1953; Ph.D., 1957.

Professors Emeriti (Clinical)

Benard C. Adler, B.S., Washington University School of Medicine, 1937; M.D., 1937.

Harold M. Cutler, A.B., University of Maine, 1930; M.D., Tufts College, 1937.

Professor (Clinical)

Morris Davidson, B.S., Indiana University, 1936; M.D., 1938.

Associate Professors

Barbara A. Bohne, A.B., Washington University, 1967; Ph.D., 1971.

Joseph E. Harvey (Experimental-Otolaryngology), B.A., University of California, Berkeley, 1954; M.A., 1964; Ph.D., 1968.

Stanley E. Thawley, B.A., University of Texas, 1963; M.D., University of Texas Medical Branch, 1967.

Research Associate Professor

A. Maynard Engebretson, B.E.E., University of Minnesota, 1958; M.S.E.E., Washington University, 1963; D.Sc., 1970.

Associate Professors Emeriti (Clinical)

William T. K. Bryan, A.B., Washington University, 1929; M.D., 1933.

Guerdan Hardy, M.D., Washington University, 1929.

Robert E. Votaw, B.S., State University of Iowa, 1927; M.D., 1929.

Associate Professors (Clinical)

Carl F. Ehrlich, B.S., St. Louis University, 1961; M.D., University of Missouri, Columbia, 1965.

Charles C. Jacobs, A.B., Washington University, 1942; M.D., 1945.

Edward H. Lyman, B.S., Washington University, 1937; M.D., 1937.

Wayne A. Viers, B.S., Phillips University, 1952; M.D., University of Oklahoma, 1956.

Joseph W. West, M.D., Duke University, 1944.

Assistant Professors

Robert Bastian, B.A., Greenville College, 1974; M.D., Washington University, 1978. (Jewish Hospital.)

Linda D'Antonio (Speech Science/Pathology), A.B., University of California—Berkeley, 1975; Ph.D., University of California—San Francisco, 1982.

Dennis P. Fuller (Speech Pathology), B.S., Northeast Missouri State University, 1969; M.A., St. Louis University, 1974; Ph.D., 1982.

Joel Goebel, B.S., University of Notre Dame, 1976; M.D., Washington University, 1980.

J. Blake Goslen III, B.S., Davidson College, 1969; M.D., University of North Carolina, 1973. (See Department of Medicine.)

Richard Hayden, B.Sc., Mount Allison University, 1968; M.Sc., Edinburgh University, 1970; M.D., C.M., McGill University, 1974.

Roanne G. Karzon (Audiology), B.A., University of Connecticut, 1974; M.Ed., University of Virginia, 1976; Ph.D., Washington University, 1982.

Laurence A. Levine, B.A., Hofstra University, 1962; M.A., 1963; D.D.S., New York University, 1967; M.D., Albany Medical College, 1971. (Jewish Hospital.)

Rodney P. Lusk, B.A., McPherson College, 1970; M.D., University of Missouri, 1977. (See Department of Pediatrics.)

Daniel C. Marcus, B.S., Antioch College, 1968; M.S., Washington University, 1971; D.Sc., 1976.

Harlan R. Muntz, B.S., Miami University, 1973; M.D., Washington University School of Medicine, 1977. (See Department of Pediatrics.)

Gary D. Paige, B.S., University of California, Irvine, 1974; Ph.D., University of Chicago, 1980; M.D., 1981. (See Departments of Neurology and Neurological Surgery and Ophthalmology.)

Margaret W. Skinner, A.B., Wellesley College, 1956; M.A., Case Western Reserve University, 1960; Ph.D., Washington University School of Medicine, 1976.

Peter G. Smith, B.S., Clemson University, 1967; Ph.D., Purdue University, 1972; M.D., Medical University of South Carolina, 1976.

Antoinette Steinacker, B.S., Western Maryland College, 1960; Ph.D., University of the Pacific, San Francisco, 1972. (See Department of Anatomy and Neurobiology.)

J. Regan Thomas, A.B., Drury College, 1968; M.D., University of Missouri, 1972.

Michael Valente (Audiology), B.A., Adelphi University, 1968; M.A., 1973; Ph.D., University of Illinois, 1975.

Research Assistant Professors

Alec N. Salt, B.Sc., University of East Anglia, 1973; M.Sc., University of Birmingham, 1974; Ph.D., 1977.

Isolde Thalmann, B.S., Washington University, 1969; A.M., 1972; Ph.D., California Western University, 1982.

Assistant Professor Emeritus (Clinical)

Herbert M. Smit, M.D., St. Louis University, 1933.

Assistant Professors (Clinical)

Wallace P. Berkowitz, B.S., University of Notre Dame, 1963; M.D., Boston University, 1967.

Sheldon Davis, B.S., Wayne State University, 1969; M.D., University of Michigan, 1973.

Norman S. Druck, A.B., Washington University, 1967; M.D., University of Illinois, 1970.

Jeffrey Fierstein, B.A., Dartmouth College, 1967; M.D., Albert Einstein College of Medicine, 1971.

Donald R. Ingram, M.D., University of Illinois, 1956.

Philip L. Martin, B.A., St. Louis University, 1968; M.D., 1968.

Supote Phipatanakul, M.D., Chulalongkorn Hospital Medical School, 1965.

Lloyd Thompson, B.A., Union College, 1960; M.D., Howard University, 1964.

Instructors

James A. Fernandez, B.S., University of Notre Dame, 1977; M.D., St. Louis University School of Medicine, 1981.

Anat Keidar, B.A., State Music Teachers' Training College, Israel, 1974; M.A., University of Iowa, 1978 & 1981; Ph.D., 1985.

Instructor Emeritus

Marion P. Bryan, A.B., Washington University, 1931.

Instructors (Clinical)

Gerald Bart, M.B.B.S., Karnatak University, 1963.

John W. McKinney, B.S., Southeast Missouri State University, 1975; M.D., University of Missouri, 1979.

Steven B. Overton, B.S., University of Michigan, 1963; M.D., 1967; M.S., 1972.

Albert F. Ruehl, B.S., Washington University, 1961; M.S., 1964; M.D., St. Louis University School of Medicine, 1973.

Robert Ryan, Jr., B.S., St. Louis University, 1968; M.D., 1973.

Richard E. Schrick, B.S., University of Missouri, Rolla, 1968; M.S., University of Missouri, Columbia, 1972; M.D., 1977.

Research Instructors

Thomas H. Comegys, B.A., Central Methodist College, 1966.

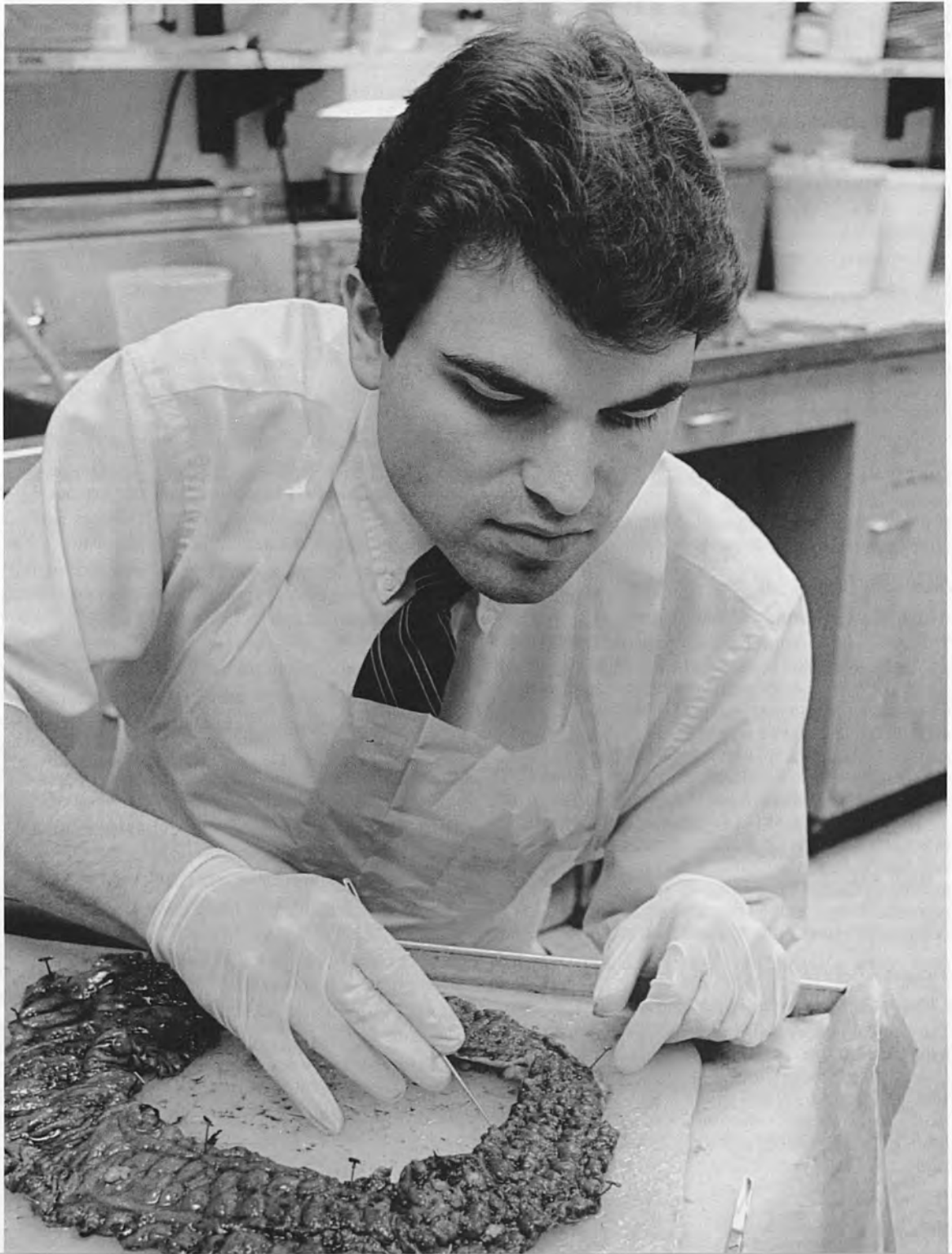
Nancy Marcus, B.S., Antioch College, 1968; M.A., Washington University, 1970.

Research Associates

William Clark, B.A., University of Michigan, 1969; M.S., 1973; Ph.D., 1975. (Also Central Institute for the Deaf.)

Gertraude Thallinger

***DEPARTMENT OF
PATHOLOGY***



PATHOLOGY

Modern pathology is concerned with the molecular and ultrastructural basis of disease. Historically, morphologic studies provided the foundations of our concepts of disease, and ultrastructural studies continue to add to our understanding, but modern pathology utilizes virtually all of the tools of basic sciences. Pathologists are involved in diagnostic, teaching, and research activities.

In addition to the second year of pathology, the department conducts numerous combined conferences which third- and fourth-year students attend as part of individual clinical clerkships. These are described below.

Students, usually in their fourth year, may elect to participate in advanced courses or clerkships in autopsy or surgical pathology or laboratory medicine, or to pursue research in experimental pathology.

The department offers a course of study leading to the Ph.D. degree. Medical students who desire to combine graduate and medical programs of study should consult Dr. Jacques Baenziger.

For the purpose of teaching, research, and service, the department is divided into specialty divisions under the following directors:

Autopsy Pathology, *Dr. McKeel*

Graduate Programs in Experimental Pathology,

Dr. Baenziger

Laboratory Medicine, *Dr. McDonald*

Neuropathology, *Dr. Nelson*

Pediatric Pathology, *Dr. Kissane*

Surgical Pathology, *Dr. R. McDivitt*

SECOND YEAR

Bio 515, 516. General Pathology

This course is a comprehensive study of the cellular and molecular basis of disease. Lectures, gross and microscopic demonstrations, laboratory work, tutorials, case studies, and experimental pathology seminars are all utilized. The course is divided into six sections, each consisting of a six-week period of study that is correlated with the subject matter concurrently presented in the sophomore pathophysiology course.

The sections consist of (1) general pathology and infectious diseases, (2) cardiovascular, pulmonary, and renal diseases, (3) metabolic, endocrine, and gastrointestinal diseases, (4) hematology and oncology, (5) neuropathology, and (6) development, pediatric, obstetric, and gynecologic diseases. *Staff*

THIRD AND FOURTH YEARS

Clinical Pathological Conference

The clinical history and treatment of patients who have died are discussed before the class by the physicians and surgeons of the departments concerned. These conferences afford students an opportunity to interpret the clinical observations in light of the post-mortem findings. One hour a week during the year. *Staff*

Laboratory Medicine Conference

One hour each week for twelve weeks during Internal Medicine rotations. Problem cases and general principles of Laboratory Medicine are discussed. *Staff*

Tumor Conference

One hour each week for twelve weeks during the surgery and obstetrics and gynecology clerkships. Problem cases are presented for illustration and discussion of all aspects of neoplastic disease. *Staff*

RESEARCH

Bio 590. Research Opportunities

The department encompasses all of the major areas of investigation in experimental pathology. Examples include:

Biochemistry of protein handling in immune induction. *Dr. Allen*

Examination of glycoprotein oligosaccharides and their role in endocytosis and cellular recognition. *Dr. Baenziger*

Kinetics and hormonal aspects of neoplastic cell growth. Human neoplastic growth and spread. *Dr. Bauer*

Human lung cancer antigens. *Dr. Bell*

Mechanism of antigen recognition by cytolytic T lymphocytes. *Dr. Braciale*

Hormones and calcium transport. *Dr. Chan*

Quantitative erythrocyte and platelet serology; immunoglobulins and complement subcomponents. *Dr. Chaplin*

Collagen metabolism and pulmonary pathology. *Dr. Crouch*

Clinicopathologic and experimental correlations in gastrointestinal and endocrine disorders. *Dr. DeSchryver*

Glucose metabolism in bacteria. *Dr. Dietzler*

Immunologic aspects of lymphoreticular disease. *Dr. Griffith*

Renal pathology, pediatric pathology. *Dr. Kissane*

Rapid diagnostic methods for the detection of opportunistic systemic fungal infections. *Dr. Kobayashi*

Mechanisms of antimalarial action, malaria and red cell deformability. *Dr. Krogstad*

Experimental pulmonary diseases. *Dr. Kubn*

Experimental diabetes mellitus, tissue culture of islets, transplantation of islets. *Dr. Lacy*

Development of monoclonal antibodies for assessing isoenzymes. *Dr. Ladenson*

Biochemistry of human mitochondrial DNA replication. *Dr. Low*

Experimental diabetes: biochemical studies of insulin release mechanisms in vitro. *Dr. McDaniel*

Biology of breast cancer. *Drs. McDivitt, Palmer*



Cellular mechanism of hormone action and intracellular Ca^{2+} metabolism. *Dr. McDonald*

Human and experimental pituitary neoplasms: pathogenetic mechanisms, cell biology, cytology, diagnosis, and treatment. *Dr. McKeel*

Developmental expression of genes regulated by nerve growth factor. *Dr. Milbrandt*

Molecular biology of blood coagulation. *Dr. Miletich*

Cell mediated immunity and systemic mycoses. *Dr. Moser*

Studies on antibiotic susceptibility of aerobic and anaerobic bacteria. *Dr. Murray*

Studies of human IgG subclass expression. *Dr. Nabm*

Pathology and pathogenesis of lesions associated with vitamin E deficiency. Biology of brain tumors. *Dr. Nelson*

Statistical theory and computer technology applications in laboratory medicine. *Dr. Parvin*

Mechanisms regulating immune responses in tissue culture systems. Cellular immunology with particular emphasis on genetic control of antibody responses. *Drs. Pierce and Kapp-Pierce*

Human histocompatibility and immune regulation. *Dr. Rodey*

Experimental cardiovascular pathology; structure-function relationships in ischemic heart disease. *Dr. Saffitz*

Biochemical mechanisms of cell-substrate and cell-cell adhesion as manifest by blood platelets. *Dr. Santoro*

Pathogenesis of experimental diabetic autonomic neuropathy. *Dr. Schmidt*

Biochemistry and biology of lymphokines. *Dr. Schreiber*

Immunopathology of renal disease. *Dr. Schreiner*

Placental transport and surface membrane structure and function. *Dr. C. Smith*

Metabolic bone disease. *Dr. Teitelbaum*

Biochemistry and biology of leukocyte T-200 proteins. *Dr. Thomas*

Arachidonic acid biochemistry and the regulation of insulin secretion. *Dr. Turk*

Immunobiology and immunopathology of lymphocyte-macrophage interactions. *Dr. Unanue*
Characterization of receptor ligand binding systems. *Dr. Valdes*

Vascular structure and function; pathophysiology of diabetic and ischemic vascular disease. *Dr. Williamson*

Immunochemistry of fibrinopeptide. *Dr. Wilner*

ELECTIVES

Advanced Special Pathology

A series of seminars discussing timely selected topics in special pathology of human disease, augmented by illustrative cases and emphasizing clinicopathologic correlations. Reading lists will be circulated and active discussion is encouraged. If the size of the group makes it practical to do so, each student will prepare and conduct a session on a subject of their choice.

Dr. Kissane

Autopsy Pathology

A full-time elective held during periods 4-8. Students assist in performing autopsies and participate fully in the activities of the Autopsy Service. Supervision is by faculty and housestaff pathologists. Emphasis is placed on the student learning as much gross pathology as possible as a preparation to be a pathologist or to serve as a general background in medical, surgical, and neurologic diseases. Weekly conferences include gross and microscopic neuropathology, specialty pathology conference, two research seminars, CPC and autopsy case review conference. Students will help prepare preliminary and final autopsy reports and will do a clinicopathologic project and present their results to the housestaff and attending faculty.

Dr. McKeel and Staff

Selected Topics in Immunology and Immunopathology

This will be a seminar course covering topics in immunology and immunopathology with emphasis both on areas of current research interest in immunology and on areas applicable to the understanding of human disease states. The subject matter can be selected so as to suit student interests but will also include organization of the immune system, immune deficiency and immunosuppression, cellular interaction in the immune response, patterns of immunological disease and diseases with immunological features, tolerance, and autoimmunity.

Dr. T. Braciale

Cell Biology of the Immune System

This is a seminar course on the biology of lymphocytes and macrophages and their interaction in normal and pathological conditions. Some background in Immunology is desirable. The course places emphasis on current research on how macrophages function in regulating the immune system in normal conditions, in infectious diseases, and in autoimmunity. Students will read and discuss two to three papers per session.

Dr. Unanue and Staff

Neuropathology Seminar

Clinical pathological correlations of neurological diseases will be investigated by the case study method using current and documented material. Participants will partake in gross neuropathological examinations and will be assigned selected cases for discussion of clinical data and gross and microscopic pathological findings, especially in relationship to evolution and mechanism of disease processes. Topics covered will include vascular, infectious, demyelinating, and neuronal diseases, as well as neoplasms of the nervous system.

Dr. Nelson

Clinical Laboratory Medicine

See Department of Medicine. *Dr. McDonald and Staff*

Anatomic Pathology—Jewish Hospital

This elective is designed to reacquaint students who have had some clinical experience with the morphological basis of disease, and to permit them to relearn normal morphological relationships. During the elective students will learn to perform gross autopsy dissections, and will be taught how to select appropriate tissue samples for further microscopic, histochemical, immunofluorescent, and electron microscopy study. Subsequently, they will learn how to perform these procedures under supervision of members of the Anatomic Pathology Staff and how to interpret their results. Following completion of appropriate studies, an in-depth report of clinical pathological correlations will be prepared for each autopsy performed. This elective is considered appropriate for students who intend careers in Internal Medicine, Surgery and Radiology.

Dr. Pierce and Staff

Laboratory Medicine—Jewish Hospital

Intensive elective training in Laboratory Hematology: Includes training in immunohematology, coagulation and special as well as routine laboratory hematology procedures. Emphasis will be placed on laboratory procedures and their relationship with patient diagnosis and management.

Dr. Pierce

Surgical Pathology—Jewish Hospital

This elective is designed to acquaint students with the discipline of Surgical Pathology and to permit them to develop basic skills in histopathological interpretation. This elective will be offered to only one student/period in order to permit maximum interaction with the Surgical Pathology Staff and House Officers. During the course of the elective, the student will be taught to function as a junior House Officer. The student will participate in the examination and dissection of gross specimens, take operating room calls, learn frozen section diagnosis, and formulate histopathological diagnoses, all in conjunction with members of the Senior Staff. Since the Laboratory of Surgical Pathology at Jewish Hospital processes a broad range of medical biopsy material as well as specimens derived from busy surgical subspecialty practice, the elective is considered desirable for students who plan careers in internal medicine and surgery as well as for those who intend to enter the field of pathology.

Dr. Pierce

Surgical Pathology

Surgical pathology offers an elective for a 6-week period under Surgical Pathology I. Students participate fully in activities of the Division of Surgical Pathology and they are responsible for dissection and description of gross specimens and microscopic diagnosis under supervision of the senior staff of the Division. Students attend morning conferences with the Director, surgical and medical grand rounds, tumor and subspecialty conferences.

In addition, Surgical Pathology II includes rotations through selected subspecialties: Neuropathology, Hematopathology, Dermatopathology, ENT Pathology, and Gynecologic Pathology. *Dr. McDivitt and Staff*

Oncology

The Division of Anatomic Pathology also offers an Oncology course for a 6-week period under the guidance of Walter C. Bauer, M.D. This elective is designed to expose the student to all aspects of neoplastic disease. Students will follow the clinical course of a variety of cancer patients, correlating clinical response with mode of treatment, state of disease, and pathologic evaluation. Students will make rounds with the medical oncologists and will follow treatment with surgery, irradiation, and chemotherapy. Correlation of the results of radiologic examinations, exfoliative cytology, and tumor kinetic studies with extent of disease and response to treatment will be studied. Students will represent in detail the treatment, rationale for therapy, and observed response on at least one patient per week. *Dr. Bauer*

Obstetrical and Gynecological Surgical Pathology

This 6-week elective offers an intensive experience in Ob-Gyn Pathology involving current surgical material from the Ob-Gyn service. Students will be expected to participate fully in the daily activities in the examination of specimens under the supervision of the senior staff. Slide reviews and conference material will be discussed. Students will attend departmental conferences and the Gyn Tumor Conference. *Dr. Gersell and Staff*

In addition to the above, the department offers a number of advanced courses in the Division of Biology and Biomedical Sciences. These courses are listed below, but are described in the offerings of the Division of Biology and Biomedical Sciences.

Bio 504. Environmental Pathology

Bio 518, 519. Pathology Research Seminar

Bio 520. Methods in Experimental Pathology

Bio 5271, 5272. Topics in Immunology

Bio 544. Mechanisms of Neoplasia

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.



Faculty

Edward Mallinckrodt Professor and Head of Department

Emil R. Unanue, B.S., Institute Secondary Ed., Havana, 1952; M.D., University of Havana, 1960.

Professors Emeriti

Lauren V. Ackerman (Pathology and Surgical Pathology), A.B., Hamilton College, 1927; M.D., University of Rochester, 1932. (Also Consultant.)

Ruth Silberberg, M.D., University of Breslau, 1931. (Also Lecturer.)

Professors

Jacques U. Baenziger, B.A., New College, 1969; M.D., Washington University, 1975.

Walter C. Bauer, B.S., Ohio State University, 1946; M.D., Washington University, 1954.

Hugh Chaplin, Jr., A.B., Princeton University, 1943; M.D., Columbia University, 1947. (See Department of Medicine.)

Judith A. Kapp-Pierce, B.A., Miami University, 1965; M.S., Indiana University, 1969; Ph.D., Harvard University, 1976. (See Department of Microbiology and Immunology.) (Jewish Hospital.)

Gerald Kessler, B.S., City College of New York, 1950; M.S., University of Maryland, 1952; Ph.D., 1954. (Jewish Hospital.)

John M. Kissane, A.B., University of Rochester, 1948; M.D., Washington University, 1952. (See Department of Pediatrics.)

Charles Kuhn, A.B., Harvard University, 1955; M.D., Washington University, 1959. (See Administration.)

Michael Kyriakos, B.S., City College of New York, 1958; M.D., Albert Einstein College of Medicine, 1962.

Robert L. Kroc Professor

Paul E. Lacy, B.A., Ohio State University, 1945; M.D., 1948; M.S., 1948; Ph.D., University of Minnesota, 1955.

Jack H. Ladenson, B.S., Pennsylvania State University, 1964; Ph.D., University of Maryland, 1971. (See Department of Medicine.)

Robert W. McDivitt, M.D., Yale Medical School, 1956.

Jay M. McDonald, B.S., Tufts University, 1965; M.D., Wayne State University, 1969. (See Department of Medicine.)

James S. Nelson, M.D., St. Louis University, 1957. (See Department of Pediatrics.)

John W. Olney, B.A., University of Iowa, 1956; M.D., 1963. (See Department of Psychiatry.)

Wilma and Roswell Messing Professor

Carl W. Pierce, A.B., Colgate University, 1962; M.D., University of Chicago, 1966; Ph.D., 1966. (See Department of Microbiology and Immunology.) (Jewish Hospital.)

Glenn E. Rodey, B.S., Ohio University, 1957; M.D., Ohio State University, 1961.

Robert D. Schreiber, B.A., State University of New York, 1968; Ph.D., 1973. (See Department of Microbiology and Immunology.)

Carl H. Smith, B.A., Swarthmore College, 1955; M.D., Yale University, 1959. (See Department of Pediatrics.)

Morton E. Smith, B.S., University of Maryland, 1956; M.D., 1960. (See Department of Ophthalmology.)

Steven L. Teitelbaum, B.A., Columbia University, 1960; M.D., Washington University, 1964. (Jewish Hospital.)

Richard Torack, B.S., Seton Hall University, 1948; M.D., Georgetown University, 1952.

Joseph R. Williamson, A.B., Phillips University, 1954; M.D., Washington University, 1958.

George D. Wilner, B.S., Northwestern University, 1962; M.D., 1965. (See Department of Medicine.) (Jewish Hospital.)

Professors (Visiting Staff)

Frederick T. Kraus, B.A., College of William and Mary, 1951; M.D., Washington University, 1955.

John S. Meyer, A.B., Yale University, 1952; M.D., Washington University, 1956.

William V. Miller, A.B., University of Missouri, 1962; M.D., 1966. (See Department of Medicine.)

Heschel J. Raskas, B.S., Massachusetts Institute of Technology, 1962; Ph.D., Harvard University, 1967.

Laurence A. Sherman, B.A., B.S., University of Chicago, 1956; M.D., Albany Medical College, 1964. (See Department of Medicine.)

Associate Professors

Harish C. Agrawal, B.Sc., Allahabad University, 1957; M.Sc., 1959; Ph.D., 1964. (See Departments of Pediatrics and Neurology and Neurological Surgery.)

C. Elliott Bell, Jr., B.S., Tulane University, 1960; M.D., 1964. (See Department of Medicine.)

Thomas J. Braciale, B.S., St. Joseph's College, 1968; M.D., University of Pennsylvania, 1975; Ph.D., 1975.

Katherine DeSchryver, M.D., University of Louvain, 1971.

David N. Dietzler, A.B., Washington University, 1957; Ph.D., 1963. (See Department of Medicine.)

Milton N. Goldstein, B.S., Western Reserve University, 1946; M.S., 1947; Ph.D., 1952. (See Department of Anatomy and Neurobiology.)

Donald J. Krogstad, A.B., Bowdoin College, 1965; M.D., Harvard Medical School, 1969. (See Department of Medicine.)

Louis G. Lange III, A.B., University of Rochester, 1970; M.D., Ph.D., Harvard University, 1976. (See Department of Medicine.)

Michael L. McDaniel, B.A., Southern Illinois University, 1963; M.S., University of North Dakota, 1966; Ph.D., St. Louis University, 1970.

Daniel W. McKeel, B.S., Hampden-Sydney College, 1961; M.D., University of Virginia, 1966. (See Administration.)

Thalachallour Mohanakumar, B.V.Sc., Madras Veterinary College, 1966; M.Sc., All India Institute of Medical Sciences, 1969; Ph.D., Duke University, 1974. (See Departments of Medicine and Surgery.)

Patrick Murray, B.S., Saint Mary's College, 1969; Ph.D., University of California, 1974. (See Department of Medicine.)

Samuel Santoro, B.S., Emory University, 1972; M.D., Vanderbilt University, 1979; Ph.D., 1979. (See Department of Medicine.)

Robert E. Schmidt, A.B., Washington University, 1969; M.D., Ph.D., 1976.

Associate Professor (Visiting Staff)

Wagih M. Abdel-Bari, B.A., School of Science, 1948; M.D., Ein Shams University, 1953; Ph.D., Washington University, 1965.

Assistant Professors

Paul M. Allen, B.S., University of Michigan, 1974; M.S., 1977; Ph.D., 1981.

Kwok-Ming Chan, B.S., Hong Kong Baptist College, 1971; Ph.D., University of South Dakota, 1977. (See Department of Medicine.)

Edmond C. Crouch, B.S., Washington State University, 1972; M.D., University of Washington, 1979; Ph.D., 1978.

Steven Dresler, B.A., Reed College, 1971; M.D., University of Oregon, 1976; M.S., 1978; Ph.D., Washington University, 1983.

Samir K. El-Mofty, B.D.S., Cairo University, 1959; M.Sc., University of Pennsylvania, 1966; Ph.D., Temple University, 1975. (Also School of Dental Medicine.)

Deborah Gersell, B.S., University of Michigan, 1971; M.D., Washington University, 1975.

Rogers C. Griffith, B.S., University of Arkansas, 1968; M.D., 1972.

Christine G. Janney, B.A., St. Louis University, 1975; M.D., 1979.

Michael L. Landt, B.S., Whitworth College, 1970; Ph.D., University of Oregon, 1976. (See Department of Pediatrics.)

Robert L. Low, A.B., University of California, 1970; Ph.D., University of Chicago, 1975; M.D., 1977. (See Department of Biological Chemistry.)

Gwen Mazoujian, B.A., Skidmore College, 1975; M.D., Duke University, 1979.

David N. Menton, B.S., Mankato State College, 1959; Ph.D., Brown University, 1966. (See Department of Anatomy and Neurobiology.)

Jeffrey D. Milbrandt, B.S., University of Nebraska, 1974; M.D., Washington University, 1978; Ph.D., University of Virginia, 1983. (See Department of Medicine.)

Joseph P. Miletich, B.S., Michigan State University, 1972; M.D., Washington University, 1979; Ph.D., 1979. (See Department of Medicine.)

Stephen A. Moser, B.S., California State University, 1969; M.S., 1972; Ph.D., Ohio State University, 1976. (Jewish Hospital.)

Moon H. Nahm, A.B., Washington University, 1970; M.D., 1974. (See Department of Medicine.)

Curtis A. Parvin, B.S., Michigan State University, 1974; M.S., University of Minnesota, 1976; Ph.D., 1980. (See Department of Medicine and Division of Biostatistics.)

Jeffrey E. Saffitz, B.A., Case Western Reserve University, 1971; M.S., 1971; Ph.D., 1977; M.D., 1978.

George F. Schreiner, A.B., Harvard College, 1971; M.D., Harvard Medical School, 1977; Ph.D., Harvard University, 1977. (See Department of Medicine.)

E. Kaye Smith, B.S., Webster College, 1957; M.S., St. Louis University, 1963; D.V.M., Kansas State University, 1965.

Matthew L. Thomas, B.S., University of Utah, 1974; Ph.D., 1981. (See Department of Microbiology and Immunology.)

Roland Valdes, Jr., B.S., University of Miami, 1969; M.S., California State University, 1972; Ph.D., University of Virginia, 1976. (Jewish Hospital.)

Research Assistant Professors

Vivian Braciale, A.B., Cornell University, 1969; Ph.D., University of Pennsylvania, 1973.

Jeffrey P. Lake, B.A., Washington and Jefferson College, 1971; M.S., Idaho State University, 1973; Ph.D., Montana State University, 1977. (Jewish Hospital.)

Bratin K. Saha, B.S., University of Calcutta, 1963; M.Sc., 1965; M.S., University of Michigan, 1968; Ph.D., St. Louis University, 1972.

Craig M. Sorenson, B.S., University of Illinois, 1976; Ph.D., Washington University, 1980. (Jewish Hospital.)

Kenneth R. Stone, B.S., University of Idaho, 1963; Ph.D., University of Colorado, 1971.

Ronald G. Tilton, B.S., University of South Florida, 1971; Ph.D., Washington University, 1977.

Assistant Professors (Visiting Staff)

William H. Boyce, Jr., B.S., St. Benedict's College, 1967; Ph.D., St. Louis University, 1973.

Kavous K. Khodadoust, M.D., Tehran University, 1965.

Andres J. Valdes, B.S., Institute de Santa Clara, 1949; M.D., University of Havana, 1957.

Assistant Professor (Clinical)

Parveen Ahmed, M.B.B.S., Karachi University, 1970.

Instructors

Elizabeth M. Brunt, B.S.,
Georgetown University, 1974; M.D.,
University of Texas, 1981.

Robert W. Ghiselli, B.S., University
of Illinois, 1977; M.S., 1978; M.D.,
1982.

Juan G. Gonzalez, B.S.,
Autonomous University of the State
of Nuevo Leon, 1971; M.D., 1979.
(Jewish Hospital.)

James O. Palmer, B.A., Vanderbilt
University, 1976; M.D., 1981.
(Jewish Hospital.)

Mary Anne Rudloff, B.A., University
of North Carolina, 1971; M.D.,
Washington University, 1979.
(Jewish Hospital.)

Instructor (Clinical)

Laurel Krewson, B.S., Carroll
College, 1974. (See Department of
Medicine.)

Research Instructors

Katherine C. Chang, B.S.,
University of Taiwan, 1969; Ph.D.,
University of Iowa, 1974.

Edward H. Finke, B.S., Washington
University, 1962.

***Instructors (Visiting
Staff)***

Tomas Aquino, S.B., Santa Clara
Institute, 1949; M.D., University of
Havana, 1957; Ph.D., University of
Chicago, 1967.

Carlos Perez-Mesa, M.D., University
of Havana, 1950.

Antonio Salvador, M.D., University
of Porto, 1963.

Research Assistants

Dorothy J. Fiete, B.S., Marymount
College, 1966.

C. Joan Fink, B.A., Lindenwood
College, 1958.

Wit A. Jamry, M.D., Medical
Academy of Poznan, 1974.

Jeanne-Marie Kiely, B.S., Bates
College, 1968; M.S., Rutgers, 1971.

Mary P. Leckie, B.S., University of
Toledo, 1967.

Yvonne Maynard, B.S., Oregon
State University, 1971; M.S.,
University of Illinois, 1972.

Vinod Nanda, Ph.D., Postgraduate
Institute of Medical Education and
Research, 1976; M.D., Santiago
University of Technology, 1985.

Santiago Plurad, B.S., University of
Philippines, 1952; M.S., Iowa State
University, 1962; Ph.D., University
of Missouri, 1967.

**EDWARD
MALLINCKRODT
DEPARTMENT OF
PEDIATRICS**



PEDIATRICS

The primary aim of the teaching program of the Department of Pediatrics is to stimulate interest in developmental biology, especially human growth and development, and to provide the student with a foundation sufficiently comprehensive so that he or she will have an appreciation of pediatric problems regardless of his or her future career choice in medicine.

The major clinical and research facilities are in Children's Hospital, St. Louis Regional Medical Center, and the newborn services at Barnes Hospital and Jewish Hospital. Children's Hospital is a new facility with 235 beds and accepts patients through 21 years of age with all types of medical problems. Hospital admissions average 8,000 annually. The Pediatric Ambulatory Division averages about 60,000 visits a year. Nearly 5,000 infants are born annually in the Medical Center.

SECOND YEAR

Students are introduced to pediatrics and to the faculty through a series of lectures and symposia designed to acquaint them with the concepts of human growth and development and the effects of age and maturity on reactions to injury and disease. The unique aspects of the physical examination of the infant and child are presented in the Introduction to Clinical Medicine Course. Members of the faculty are active participants in the Sophomore Pathophysiology Course.

THIRD YEAR

A clerkship of six weeks is scheduled where the student participates in the following:

1. Care of inpatients and outpatients, sharing responsibility with resident physicians.
2. Daily rounds and bedside conferences with house staff and attending physicians.
3. Patient management conferences on basic pediatric problems emphasizing pathophysiologic mechanisms.
4. Weekly grand rounds.
5. Weekly case conference.

FOURTH YEAR

This year is devoted to elective time which may be spent according to the individual preferences of the student, who may serve as an intern substitute or in the research laboratory or combine clinical and laboratory work. The following electives are offered:

Allergy and Immunology

(A) Allergy and Clinical Immunology: Inpatient and outpatient clinical experience in the evaluation, diagnosis and treatment of children with a wide spectrum of allergic and immunologic disorders. Clinical and laboratory correlation is emphasized. Elective includes attendance at three weekly Immunology conferences. *Dr. Polmar*

(B) Research.

1. Work includes: (a) The Evolution of the Immune Adherence Phenomenon. A candidate molecule on rabbit platelets as well as peripheral blood mononuclear cells equivalent to human complement receptor CR1 has been identified. Investigations will now include other cell types in the rabbit system, such as B,T null cells and monocytes in order to describe complement receptors in this non-primate system, thus contributing to the evolution of complement receptors engaged in clearing immune complexes from the circulation of organisms. (b) Human alveolar and peritoneal macrophages are being studied for the presence of the complement receptor CR1. An additional C3b binding molecule like "gp 45-70," which is found on rabbit alveolar macrophages, may be involved in rosetting and phagocytosis. The structure, function and regulation of this putative C3b binding protein will be studied.

Dr. Manthei

2. Work includes: (a) Studies of the pharmacological and immunological mechanisms by which adenosine and other autotoxins influence the immunoregulatory behavior of human T-lymphocytes. Studies include identification of the pharmacologic receptors and lymphokine receptors involved in these immunoregulatory processes. (b) Studies of antibiotic hypersensitivity in children with special emphasis upon the activation and interaction of lymphocyte populations and their relationship to the clinical manifestations and natural history of drug allergy. *Dr. Polmar*

Cardiology

(A) Clinical Elective—Inpatient. The student works as a subintern and is assigned selected patients on the Pediatric Cardiology ward. *Dr. Strauss and Staff*

(B) Clinical Elective—Outpatient. The student will see patients attending all of the outpatient units including both new referrals and follow-up visits. The student will also be responsible for the interpretation of electrocardiograms, echocardiograms, and 24-hour Holter monitor examinations performed in the cardiology non-invasive laboratory. *Dr. Strauss and Staff*

(C) Research.

1. Use of non-invasive imaging techniques (ultrasound, nuclear magnetic resonance) for evaluation and management of congenital heart diseases. *Dr. Canter*

2. Follow-up Studies of Repaired Coarctation of the Aorta. A project to determine incidence of recoarctation especially in the infant group, and the adequacy of repair in older children. Studies will be non-invasive and patients will be evaluated by blood pressure determination at rest as well as during and after an exercise stress test on the bicycle ergometer. Patients will also have studies by magnetic resonance, echocardiography and electrocardiography.

Dr. Goldring

3. Clinical research includes: Arrhythmias in children, the association of arrhythmias and tumors in tuberous sclerosis, and in the evaluation of children following repair of congenital heart disease. *Dr. Martin*



4. Studies concern the molecular basis of compartmentation of newly synthesized proteins. This research is conducted in the Department of Biochemistry and involves recombinant DNA technology, cloning of various DNA fragments and cell biological techniques. *Dr. Strauss*

Clinical Laboratories

(A) Studies concern the mechanism by which glucose controls insulin secretion. Of particular interest are the roles of calcium-dependent protein kinases in this mechanism. *Dr. Landt*

(B) Studies investigate the cellular processes underlying the transport of nutrients by the human placental syncytiotrophoblast. Plasma membranes isolated specifically from the maternal- and fetal-facing surfaces are used to investigate the transport of amino acids and calcium. *Dr. Smith*

Endocrinology and Metabolism

(A) Clinical Endocrinology and Metabolism. This elective is designed to include broad clinical experience in pediatric endocrine and metabolic problems. The student has the opportunity to evaluate many of the pediatric endocrine patients and to see some adult patients during weekly rounds. Emphasis is placed on the practical management of common problems. The student attends rounds and clinics (endocrine, metabolic, and diabetic) and the joint metabolic seminar

and rounds held with the medical service. A large number of patients with varied problems are studied in depth during the elective. *Drs. Bier, Santiago and Staff*

(B) Research.

1. Ongoing research in growth disorders includes the study of children with idiopathic and organic hypopituitarism, gonadal dysgenesis, delayed puberty, and short stature of unknown causes. Laboratory research is aimed at identifying variant forms of growth hormone and the somatomedins which may have decreased biological activity. *Dr. Bier*

2. Studies involve developing and employing insulin infusion devices as well as testing the feasibility of pancreatic islet transplantation in man. Also studied are the mechanisms of normal and abnormal glucose counter-regulation during hyperinsulinemia, and the mechanisms and natural history of diabetic complications. *Dr. Santiago*

3. This laboratory is primarily interested in the study of hepatic glycogen; in particular, the substrate composition of glycogen and the hormonal regulation of its synthesis and degradation. The main technique used is NMR spectroscopy which allows for a dynamic study of these processes *in vivo*. *Dr. Shalwitz*

4. This laboratory is engaged in the development and application of biochemical techniques to study the structure and function of oligosaccharide units on glycoproteins. The laboratory is currently investigating the biosynthesis and glycosylation of insulin and insulin-like growth factor I (IGF 1) receptors. *Dr. Tollefsen*

Gastroenterology

(A) Research interests include: (1) National collaborative study of Reye syndrome and drug use in common childhood illnesses. Contributing case and control data to 14-center effort; and (2) natural history studies of pediatric gastrointestinal illness including stool holding and soiling and Henoch Schonlein Purpura and x-linked glycogen storage disease. *Dr. Keating*

(B) Research studies include the expression and regulation of human hepatic acute phase proteins, especially proteinase inhibitors. This work involves the study of well-characterized regulatory molecules (e.g., interleukin-1 and cachectin/tumor necrosis factor) and their effect on the expression of proteinase inhibitors (e.g., alpha-1-antitrypsin) in hepatic and extrahepatic sites of synthesis. These studies are designed to ultimately address the role of proteinase-inhibitor balance during homeostasis, inflammation and in inherited inhibitor deficiency states (e.g., homozygous PIZZ alpha-1-antitrypsin deficiency associated with hepatitis in neonates and pulmonary emphysema in adults). *Dr. Perlmutter*

(C) Interaction between microorganisms and host defense in relation to the release of proteases and their inhibitors during infection. Role played by LPS and pseudomonas elastase on the synthesis of alpha-1-antitrypsin by human monocytes and Hep G2 cells. *Drs. Perlmutter; Morel*

(D) Studies include investigation of the metabolic fates of specific pancreatic digestive proteins following their secretion into the small intestine and release into the bloodstream. These studies should provide insight into the mechanism of exocrine secretion, factors regulating their intraluminal metabolism, and the potential function of enzymatically active pancreatic proteins in the circulation. Rapid immunoassays for human pancreatic amylase in serum have also been developed using monoclonal antibodies which may prove to be useful in diagnosing exocrine pancreatic inflammation and insufficiency. *Dr. Rosenblum*

General Pediatrics

(A) General Clinical Pediatrics—Children's Hospital. The student will be assigned patients on the general pediatric divisions for initial evaluation and continuing care. The student works as an extern and is expected to take night call every third night. Students work directly under the supervision of the senior resident, and teaching rounds are conducted by the faculty. The elective will provide experience in management of many pediatric medical conditions including a wide variety of infectious diseases, failure to thrive, acute asthma, poisoning, immune deficiency diseases, and gastrointestinal disorders. *Dr. Colten and Staff*

(B) Introduction to Primary Pediatric Care. A student will participate in the evaluation of infants, children and adolescents coming to a pediatrician's office. In addition to medical illnesses, the opportunity to do minor surgical procedures, learning appropriate counseling of families with minor or major social problems, becoming acquainted with community services available to families for referral, knowledge of day care centers and problems of the adolescent are all aspects incorporated in this elective. *Drs. Middelkamp, Nash*

(C) Primary Care in General Pediatrics. This elective is designed to provide the student with firsthand experience in general pediatric practice in a model ambulatory care setting, the Medical Care Group of St. Louis (MCG). The major component of the elective is direct patient care under the supervision of senior physicians who are members of the group. The objective of this elective is to provide the student with the actual experience of serving as a general pediatrician providing comprehensive health services to the families of a typical, broadly-based population receiving care in an alternate delivery system. The MCG is a teaching and research prepaid program practice located on the Medical School campus. (Two optional alternate facilities are located in St. Louis County.)

Dr. Simons

Genetics

(A) Clinical Genetics. Students will be exposed to a broad variety of clinical problems encountered in the Division of Medical Genetics. Patients will be seen during inpatient consultation as well as during Genetics Clinic. Emphasis during this rotation will be placed in several areas: (1) learning physical examination skills appropriate for dysmorphic patients; (2) approaches to patients with hereditary metabolic disorders and families with genetic disease; (3) integration of diagnostic laboratory and radiographic studies with clinical information in genetic diseases. *Dr. Downton and Staff*

(B) Research.

1. Studies include: (a) The molecular regulation of acute phase proteins using the Syrian hamster as a model for amyloidosis. At present we are studying: the structure of the genes; peptide and steroid mediators modulating the synthesis of these proteins; the sites of extrahepatic synthesis; and the fetal response to inflammation. (b) Molecular events in familial malignancy. In this project we are examining DNA isolated from specimens of humans for loss of heterozygosity at a variety of loci using cloned probes. *Dr. Downton*

2. Primary research has involved the study of fragile sites on human chromosomes and, in particular, the fragile X syndrome. These studies have included segregation analyses and the application of linked DNA markers to improve diagnostic accuracy. In-depth studies are done of rare abnormalities which are detected in the Diagnostic Cytogenetic Laboratory. *Dr. Watson*

Hematology and Oncology

(A) Clinical Hematology and Oncology. During this elective students will see a variety of children with hematologic disorders and malignancies. The student will follow patients in the hematology-oncology outpatient unit, work up inpatient consultations, and attend daily hospital rounds on the hematology-oncology patients. The course also includes formal instruction on interpretation of peripheral blood and bone marrow morphology and teaching rounds and conferences. *Dr. Schwartz and Staff*

(B) Research.

1. Studies include: (a) molecular genetic events associated with the development and progression of human neuroblastoma, especially changes in recessive "suppressor" genes and proto-oncogenes; and (b) the role that these genes play in the growth and differentiation of normal neurons. *Dr. Brodeur*

2. Research interests include the regulation of cell membrane receptor expression during cell growth and specifically the role of phosphorylation in regulating receptor expression and receptor-mediated endocytosis. *Dr. Fallon*

3. (a) Clinical and laboratory studies in the diagnosis and management of children with acute lymphoblastic leukemia (ALL); (b) management of leukemia involving the central nervous system, as well as varicella-zoster prophylaxis in children with ALL. *Dr. Land*

4. Investigative efforts are aimed at the cell biology of cell surface receptors. Using biochemical approaches, we are dissecting the mechanisms responsible for receptor-mediated endocytosis of nutrients and growth factors. *Dr. Schwartz*

5. Dr. Vietti is Chairman of the Pediatric Oncology Group and responsible for the organization and execution of protocol studies at 36 major medical centers plus 24 affiliate institutions in the USA, Canada and Europe and over 700 investigators who care for children with cancer. An additional interest is new agent studies in pediatric cancer. *Dr. Vietti*

6. Research interests include the natural history of sickle cell disease and the rheology of hgb SS containing red cells. Other research concerns characterizing heritable red cell membrane defects, such as pyropoikilocytosis. *Dr. Zarkowsky*

Infectious Diseases

(A) Clinical Infectious Diseases. This elective is designed to introduce students to the clinical aspects of infectious diseases in children. Students will consult on both inpatients and outpatients. Regular daily activities will include evaluation of new patients, work rounds on inpatient consults, microbiology teaching rounds in the bacteriology lab, and teaching rounds with the infectious disease attending. Students will be expected to take night call from home every third night. Formal teaching sessions include weekly pediatric infectious disease case conferences, a weekly joint clinical conference with the adult infectious disease group, and a weekly journal club. *Dr. Granoff and Staff*

(B) Research.

1. *Haemophilus Influenzae* Otitis Media: Protective Immunity. These studies concern the epidemiology and natural immune response to nontypable *Haemophilus influenzae* otitis in children, and similar studies of the immune response in the chinchilla experimental model of otitis. The goals of this work are to define the important antigenic components of these bacteria which might hold promise as components of future vaccines for the prevention of *Haemophilus* otitis. *Dr. Barenkamp*

2. Molecular Epidemiology of *Haemophilus Influenzae* Type b Infection. The aim of this work is to identify methods for differentiating among strains of type b *Haemophilus*. Characters being examined include outer membrane proteins, alloenzymes, monoclonal antibody reactivity and DNA polymorphisms. The results will be directly applicable to investigation of outbreaks and transmission of infection caused by this organism. *Drs. Granoff, Munson*

3. Genetic Control of Antibody Responses to Polysaccharide Antigens. This study is designed to examine genetic aspects of susceptibility to *Haemophilus* meningitis and epiglottitis, and IgG subclass responses to polysaccharide vaccines. Studies are underway in normal and immunodeficient populations, as well as on an inbred human (Amish) population.

Dr. Granoff and Staff

4. Interaction between microorganisms and host defense in relation to the release of proteases and their inhibitors during infection. Role played by LPS and pseudomonas elastase on the synthesis of alpha-1-antitrypsin by human monocytes and Hep G2 cells.

Drs. Morel, Perlmutter

5. Outer Membrane Proteins of *Haemophilus Influenzae* Type b. The surface components of this bacterium are being analyzed with the long-term objective of developing a vaccine against the most common form of bacterial meningitis in children. During this year, the gene for one of the major outer membrane proteins (P1) was cloned and the gene expressed in *E. coli*. Sequencing of the gene will be completed in the near future and this data, along with data obtained from monoclonal antibody studies (also in progress), will lead to identification of the surface-exposed epitopes of the protein. *Drs. Munson, Granoff*

6. The Development of the Human B Cell Response to Polysaccharide Antigens. These studies concern the maturation in children of the subclass repertoire and clonal diversity of antibodies produced in response to bacterial polysaccharide (PS) antigens. Also, the laboratory is examining the anti-PS antibody responses of children with IgG2 deficiency, sickle cell anemia and asplenia. *Dr. Shackelford*

7. Strain Variation in Respiratory Syncytial Virus. The goals of this study are to use monoclonal antibodies, electrophoresis of isotopically labeled viral proteins and nucleic acid hybridization probes to detect variation among strains of respiratory syncytial virus.

Dr. Storch



Nephrology

(A) Clinical Nephrology. This course is designed to provide the student with a wide exposure to all aspects of pediatric renal disease and an opportunity to explore a desired aspect of the field in depth. The student will be an integral part of the Renal Team and as such will see a large number of both inpatients and outpatients. Students will have an opportunity to follow the courses of patients with acute renal disease as well as those with more chronic problems and will help to plan the evaluation and therapeutic management of these patients. Discussions and rounds with the attending staff and fellows emphasize the relationship between clinical problems and the pathophysiology of the underlying disease. These informal teaching sessions are supplemented by more formal sessions. These include renal attending rounds, renal research rounds, and journal clubs which are conducted weekly in conjunction with the Renal Divisions, Barnes and Jewish Hospitals. Formal conferences are held regularly in association with Dr. John Kissane (renal pathology). Attendance at the weekly pediatric grand rounds and pediatric case conferences is encouraged. Students will be required to present one or two in-depth reviews of areas of interest to them either in renal physiology or clinical topics. *Dr. Robson and Staff*

(B) Research.

1. Major interests of the laboratory are: (a) application of atrial peptides in conditions of renal failure (acute, chronic, cyclosporine toxicity); (b) the identification and characterization of the renal tubular receptor for atrial peptides in health and disease; and (c) the measurement of molecular motion of phospholipids in renal tubular basement membranes in induced tubular toxicity and diabetes mellitus. *Dr. Cole*

2. Minimal change nephrotic syndrome of childhood is one of the more common renal diseases in children. Its cause is unknown. The laboratory is investigating the thesis that the disease has a genetic basis and is mediated through an abnormality in the immune system which results in neutralization of negative charge sites in the kidney, in the microvasculature and on platelets to generate the clinical symptoms and signs typical of the disease. *Dr. Robson*

3. The work of this laboratory has three main goals: (a) isolation and structural characterization of human soluble immune response suppressor (SIRS); (b) identification of the events involved in both activation of SIRS production and inhibition of cell function by SIRS; and (c) determination of the role(s) SIRS may play in mediating immunosuppression or other disease states. *Dr. Schnaper*

4. Goals of this research are to understand the signals and mechanisms leading to compensatory adaptation in chronic loss of functioning renal mass (whether experimental surgical or due to chronic disease) and to define the cause of ultimate progression of renal failure under these circumstances. Also, *in vitro* renal tubular microperfusion is used for studying the tubular transport functions. *Dr. Vebaskari*

Neurology

(A) Clinical Neurology. The student participates as a full member of the neurology service team and is directly responsible for a proportion of the patients on the service under the direction of the senior resident. The student is expected to take night call every third or fourth night, during which time he/she is responsible for the medical care of the entire unit, as well as for emergency admissions. The student will also see outpatients one day a week, during which time he/she will be able to evaluate outpatient problems.

Dr. Volpe and Staff

(B) Research.

1. Biochemistry of myelin proteins, with a particular emphasis on post-translational modification.

Dr. Agrawal

2. NMR spectroscopic studies of developing mammalian brain in the normal animal and in pathological states. *Dr. Deuel*

3. Pharmacokinetics and pharmacodynamic interactions of anticonvulsant drugs. *Dr. Dodson*

4. Control of growth and differentiation of cultured neurons and Schwann cells. *Dr. Johnson*

5. Biochemistry of cytoskeletal proteins in developing rat brain and spinal cord. *Dr. Noetzel*

6. Mechanisms of neuronal death with oxygen deprivation, with a particular emphasis on excitotoxic amino acids. *Dr. Rothman*

7. Regulation of membrane lipid biosynthesis and glycoprotein biosynthesis in primary cultures of astrocytes, oligodendroglia and neurons. *Dr. Volpe*

Newborn Medicine

(A) Clinical Newborn Medicine. The goal of this course is to provide students with responsibility for caring for newborn infants (who range from normal, to acutely ill, to chronically ill) and their families. The physiology of the transition from fetal to extrauterine existence, the pathophysiology of specific diseases, and primary accountability of the student for patient management decisions and procedures will be emphasized. In addition, collaboration with nursing staff and other health care providers in decision-making (especially concerning the viability of individual infants) and family management will be regularly required.

Two students during each rotation will be assigned to the Special Care Nursery at Children's Hospital and one student to the Labor and Delivery Services at Barnes and Jewish Hospitals. Students assigned to the Children's Hospital Special Care Nursery will also have the opportunity to become involved in the transport of acutely ill infants, while those on the Labor and Delivery Service will routinely be involved in normal newborn care and delivery room management. The student will be expected to rotate patient responsibilities every third night. *Dr. Cole and Staff*

(B) Research.

1. (a) Lysosomal and nonlysosomal turnover of plasma membrane proteins; (b) mechanisms which regulate turnover and degradation of specific plasma membrane receptors; (c) signals by which proteins are tagged for degradation. *Dr. Bearer*

2. (a) Development and mechanisms of respiratory control and pulmonary mechanics in newborn infants; (b) pathogenesis of bronchopulmonary dysplasia. *Dr. Coblentz*

3. (a) Developmental regulation of complement biosynthesis in mononuclear phagocytes; (b) cellular and molecular basis of genetically determined plasma protein deficiencies; (c) molecular regulatory mechanisms of endotoxin and interferon-gamma. *Dr. Cole*

4. (a) Molecular and cellular biology of copper metabolism during human development; (b) molecular and cellular biology of placental protein transport mechanisms during development. *Dr. Gitlin*

5. The relationship of aberrations of cerebral blood flow to subsequent neuropathology such as intraventricular hemorrhage, hypoxia, ischemic encephalopathy, or periventricular leukomalacia. *Dr. Perlman*

6. Biology of pain in the newborn infant including behavioral, physiological, biochemical, and developmental outcome variables. *Dr. Porter*

7. Studies include: (a) mechanical and neural mechanisms in regulation of upper airway patency in infants and in an animal model; and (b) pathophysiology of apneic episodes in young infants. *Dr. Thach*

Pulmonary Diseases

(A) The molecular basis for deficiencies of specific proteins involved in the inflammatory response in animal models and the effect of these deficiencies on the inflammatory response are ongoing projects. Also being studied: the association between the hyperinflammatory state and progressive pulmonary disease in cystic fibrosis patients. *Dr. Auerbach*

(B) Genetic regulation and ontogeny of the tissue specific expression of complement genes and acute phase proteins as models of inflammation. *Dr. Colten*

(C) The molecular biology of complement deficiencies and structural analysis of the evolution of complement gene families are investigated. *Dr. Wetsel*

(D) Current clinical research projects include: (1) Mechanism of corticosteroid modulation of lung function in cystic fibrosis. An attempt to define the immunologic and mechanical changes occurring in the respiratory system of children with cystic fibrosis who are treated with corticosteroids; (2) Allergic bronchopulmonary aspergillosis in cystic fibrosis. An attempt to define the immunologic mechanism of lung disease in cystic fibrosis patients who have some criteria of allergic bronchopulmonary aspergillosis. The hope is that a definitive diagnostic constellation of findings will be available and a component of long-term followup will be included in the study; (3) Lung function in normal black children. A study of lung volumes, diffusing capacity, and spirometry measurements from a wide population base. *Dr. Wheeler*

Faculty

Harriet B. Spoehr Professor and Head of Department

Harvey R. Colten, B.A., Cornell University, 1959; M.D., Western Reserve University, 1963; M.A. (hon.), Harvard University, 1978. (See Department of Microbiology and Immunology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Pinsky, A.B., Cornell University, 1951; M.D., New York University, 1955. (See Department of Neurology and Neurological Surgery.)

A. Ernest and Jane G. Stein Professor of Developmental Neurology in Pediatrics

Joseph J. Volpe, B.A., Bowdoin College, 1960; M.D., Harvard University, 1964. (See Departments of Neurology and Neurological Surgery and Biological Chemistry.)

Professors Emeriti

David Goldring, A.B., Washington University, 1936; M.D., 1940. (Also Lecturer.)

Donald L. Thurston, B.S., Vanderbilt University, 1934; M.D., 1937.

Jean H. Thurston, B.A., University of Alberta, 1938; M.D., 1941. (See Department of Neurology and Neurological Surgery.)

Professors

Harish C. Agrawal, B.Sc., Allahabad University, 1957; M.S., 1959; Ph.D., 1964. (See Departments of Neurology and Neurological Surgery and Pathology.)

Dennis M. Bier, B.S., LeMoyne College, 1962; M.D., New Jersey College of Medicine, 1966. (See Department of Medicine.)

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department of Neurology and Neurological Surgery.)

W. Edwin Dodson, A.B., Duke University, 1963; M.D., 1967. (See Department of Neurology and Neurological Surgery.)

Dan M. Granoff, B.A., Johns Hopkins University, 1965; M.D., 1968. (See Department of Microbiology and Immunology.)

Alexis F. Hartmann, Jr., B.S., Washington University, 1947; M.D., 1951.

John C. Herweg, B.S., Drury College, 1943; M.D., Washington University, 1945. (See Administration.)

Lawrence I. Kahn (Health Care Research), A.B., University of Alabama, 1941; M.D., Louisiana State University, 1945.

James P. Keating, A.B., Harvard University, 1959; M.D., 1963.

John M. Kissane, A.B., University of Rochester, 1948; M.D., Washington University, 1952. (See Department of Pathology.)

William H. McAlister, B.S., Wayne State University, 1950; M.D., 1954. (See Department of Radiology.)

J. Neal Middelkamp, B.S., University of Missouri, 1946; M.D., Washington University, 1948.

James S. Nelson, M.D., St. Louis University, 1957. (See Department of Pathology.)

Stephen H. Polmar, B.S., Union College, 1961; Ph.D., Case Western Reserve University, 1966; M.D., 1967. (See Department of Microbiology and Immunology.)

Alan M. Robson, M.B.B.S., University of Durham, 1959; M.D., 1964. (See Department of Medicine.)

Julio V. Santiago, B.S., Manhattan College, 1963; M.D., University of Puerto Rico, 1967. (See Department of Medicine.)

Alan L. Schwartz, A.B., Case Western Reserve University, 1970; Ph.D., 1974; M.D., 1976. (See Department of Pharmacology.)

Gary D. Shackelford, B.A., Northwestern University, 1964; M.D., Washington University, 1968. (See Department of Radiology.)

Carl H. Smith, B.A., Swarthmore College, 1955; M.D., Yale University, 1959. (See Department of Pathology.)

Arnold W. Strauss, B.A., Stanford University, 1966; M.D., Washington University, 1970. (See Department of Biological Chemistry.)

Robert C. Strunk, B.A., Northwestern University, 1964; M.S., 1968; M.D., 1968.

Jessie L. Ternberg, A.B., Grinnell College, 1946; Ph.D., University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Surgery.)

Bradley T. Thach, A.B., Princeton University, 1964; M.D., Washington University, 1968.

Teresa J. Vietti, A.B., Rice University, 1949; M.D., Baylor University, 1953. (See Department of Radiology.)

Clarence S. Weldon, A.B., University of Michigan, 1951; M.D., Johns Hopkins University, 1955. (See Department of Surgery.)

Virginia V. Weldon, A.B., Smith College, 1957; M.D., University of Buffalo, 1962. (See Administration.)

Professors Emeriti (Clinical)

Joseph C. Jaudon, A.B., Washington University, 1926; M.D., 1933.

Park J. White, A.B., Harvard University, 1913; M.D., Columbia University, 1917.

Professors (Clinical)

Maurice J. Keller, A.B., Yale University, 1936; M.D., Columbia University, 1940.

Maurice J. Lonsway, Jr., A.B., Washington University, 1946; M.D., 1950.

James E. Miller, B.S., Tulane University, 1946; M.D., Medical College of Alabama, 1949. (See Department of Ophthalmology.)

Helen E. Nash, A.B., Spelman College, 1941; M.D., Meharry Medical College, 1945.

George Sato, M.D., Washington University, 1947.

Argyrios A. Tsifutis, M.D., Aristotelion University of Thessalonika, 1954.

Associate Professor Emeritus

Dorothy J. Jones, A.B., Oberlin College, 1930; M.D., Washington University, 1934.

Associate Professors

Garrett M. Brodeur, B.A., St. Louis University, 1971; M.D., Washington University, 1975. (See Department of Genetics.)

Barbara R. Cole, B.A., Doane College, 1963; M.D., University of Kansas, 1967.

F. Sessions Cole, B.A., Amherst College, 1969; M.D., Yale University, 1973.

Ruthmary K. Deuel, B.A., Mount Holyoke College, 1956; M.D., Columbia University College of Physicians and Surgeons, 1961. (See Department of Neurology and Neurological Surgery.)

Felton J. Earls, B.S., Howard University, 1963; M.D., 1967. (See Department of Psychiatry.)

Mary I. Johnson, B.S., Washington State University, 1964; M.D., Johns Hopkins University, 1968. (See Departments of Anatomy and Neurobiology and Neurology and Neurological Surgery.)

Vita J. Land, B.S., McGill University, 1961; M.D., 1965.

Charles B. Manley, Jr. (Genitourinary Surgery), A.B., University of Missouri, 1955; M.D., 1958. (See Department of Surgery.)

Jeffrey L. Marsh, B.A., Johns Hopkins University, 1967; M.D., 1970. (See Department of Surgery.)

Penelope G. Shackelford, B.S., University of Wisconsin, 1964; M.D., Washington University, 1968. (See Department of Microbiology and Immunology.)

Marilyn J. Siegel, A.B., Washington University, 1965; M.D., State University of New York, Downstate, 1969. (See Department of Radiology.)

Paul S. Simons, B.A., University of Texas, 1963; M.D., Washington University, 1967. (See Medical Care Group.)

James K. Turner, A.B., Washington University, 1949; M.D., 1953. (See Medical Care Group.)

Harold Zarkowsky, A.B., Washington University, 1957; M.D., 1961.

Associate Professors Emeriti (Clinical)

Helen M. Aff, B.S., Washington University, 1934; M.D., 1934.

Max Deutch, M.D., Washington University, 1926.

Stanley L. Harrison, B.S., Washington University, 1928; M.D., 1930.

Frederick A. Jacobs, B.S., Washington University, 1927; M.D., 1928.

Sol Londe, B.S., Washington University, 1925; M.D., 1927.

Bernard Schwartzman, A.B., Washington University, 1931; M.D., 1935.

Frank S. Wissmath, A.B., Washington University, 1939; M.D., 1943.

Associate Professors (Clinical)

Gordon R. Bloomberg, A.B., University of Illinois, 1955; B.S., 1955; M.D., 1959.

C. Read Boles, A.B., Washington University, 1940; M.D., 1943.

Robert H. Friedman, M.D., Washington University, 1948.

Gene H. Grabau, B.S., St. Louis College of Pharmacy, 1937; M.D., Washington University, 1942.

Marshall B. Greenman, B.S., University of Illinois, 1946; M.D., 1948.

Kenneth A. Koerner, A.B., Washington University, 1935; M.D., 1941.

John C. Martz, A.B., University of Missouri, 1938; M.D., Washington University, 1942.

Frederick D. Peterson, A.B., Knox College, 1953; M.D., Washington University, 1957.

Warren G. Sherman, B.A., University of Missouri, 1965; M.D., Tulane University, 1969.

Assistant Professors

Harvey S. Auerbach, B.A., Brooklyn College, 1972; M.D., Autonomous University of Guadalajara, 1976.

Stephen J. Barenkamp, B.A., Carleton University, 1973; M.D., University of Chicago, 1977.

Richard J. Bower, B.S., Northern Illinois University, 1965; M.D., University of Virginia, 1969. (See Department of Surgery.)

Fred C. Chu, A.B., Princeton University, 1967; M.D., Cornell University, 1971. (See Department of Ophthalmology.)

S. Bruce Dowton, B.M., B.S., University of New South Wales, 1980. (See Department of Genetics.)

Robert J. Fallon, B.S., Yale University, 1974; M.D., New York University, 1980; Ph.D., 1980.

John E. Forestner, B.A., Northwestern University, 1966; M.D., 1970. (See Department of Anesthesiology.)

Jonathan D. Gitlin, B.S., University of Pittsburgh, 1974; M.D., 1978.

Gary E. Hirshberg, A.B., Princeton University, 1968; M.D., Hahnemann Medical College, 1972. (See Department of Anesthesiology.)

Michael L. Landt (Laboratory Medicine), B.S., Whitworth College, 1970; Ph.D., University of Oregon, 1976. (See Department of Pathology.)

Rodney P. Lusk, B.A., McPherson College, 1970; M.D., University of Missouri, Columbia, 1977. (See Department of Otolaryngology.)

Uwe Manthei, M.D., Georg-August-University, 1974.

Thomas C. Martin, A.B., Cornell University, 1973; M.D., University of Michigan, 1976.

Robert S. Munson, B.A., University of Connecticut, 1968; Ph.D., 1976.

Harlan R. Muntz, B.S., Miami University, 1973; M.D., Washington University, 1977. (See Department of Otolaryngology.)

Michael J. Noetzel, A.B., Yale University, 1973; M.D., University of Virginia, 1977. (See Department of Neurology and Neurological Surgery.)

Jeffrey M. Perlman, M.B., Ch.B., University of Cape Town, 1974.

David H. Perlmutter, B.A., University of Rochester, 1974; M.D., St. Louis University, 1978. (See Department of Cell Biology and Physiology.)

Mabel L. Purkerson, A.B., Erskine College, 1951; M.D., Medical College of South Carolina, 1956. (See Administration and Department of Medicine.)

Jerry L. Rosenblum, B.A., Emory University, 1970; M.D., Washington University, 1974.

Robert J. Rothbaum, B.A., Brown University, 1972; M.D., University of Chicago, 1976.

Steven M. Rothman, M.D., State University of New York, Upstate, 1973. (See Departments of Anatomy and Neurobiology and Neurology and Neurological Surgery.)

H. William Schnaper, B.A., Yale University, 1971; M.D., University of Maryland, 1975.

Gregory A. Storch, A.B., Harvard University, 1969; M.D., New York University School of Medicine, 1973. (See Department of Medicine.)

Sherida A. Tollefsen, B.A., Grinnell College, 1971; M.D., Washington University, 1975.

V. Matti Vehaskari, M.D., Helsinki University, 1970.

Michael S. Watson, B.S., American University, 1974; M.S., University of Alabama, 1977; Ph.D., 1981. (See Department of Genetics.)

Zila Welner, M.D., Hebrew University, 1961. (See Department of Psychiatry.)

Rick A. Wetsel, B.S., University of Texas, Austin, 1976; Ph.D., University of Texas, San Antonio, 1982.

William B. Wheeler, B.A., Vanderbilt University, 1974; M.D., University of Tennessee, 1977.

Michael P. Whyte, B.A., New York University, 1968; M.D., State University of New York, Downstate, 1972. (See Department of Medicine.)

Research Assistant Professors

Alan M. Delamater, B.A., Carnegie-Mellon University, 1975; M.S., University of Georgia, 1979; Ph.D., 1981. (Also Department of Psychology.)

Ronald L. Gingerich, B.A., Goshen College, 1970; Ph.D., Indiana University, 1975. (See Department of Medicine.)

Barbara K. Talent (Psychology), B.A., DePauw University, 1972; Ph.D., Washington University, 1978.

Assistant Professors Emeriti (Clinical)

Martin Calodney, B.S., College of the City of New York, 1930; M.D., New York University, 1936.

Samuel W. Gollub, B.S., Washington University, 1941; M.D., 1941.

Edith C. Robinson, A.B., Randolph-Macon College, 1927; M.S., University of South Carolina, 1928; M.D., Johns Hopkins University, 1932.

Alfred S. Schwartz, A.B., Amherst College, 1932; M.D., Johns Hopkins University, 1936.

Assistant Professors (Clinical)

Jill M. Baer, B.S., University of Kentucky, 1972; M.D., 1975.

Edward T. Barker, A.B., Princeton University, 1953; M.D., Washington University, 1957.

Walter F. Benoist, A.B., University of Pennsylvania, 1968; M.D., Washington University, 1972.

Max H. Burgdorf, A.B., Washington University, 1970; M.D., 1974. (See Medical Care Group.)

Garrett C. Burris, B.S., University of Southwestern Louisiana, 1964; M.D., Louisiana State University, 1968. (See Department of Neurology and Neurological Surgery.)

James M. Corry, B.S., Grinnell College, 1970; M.D., Washington University, 1974.

Charles H. Dougherty, A.B., College of the Holy Cross, 1969; M.D., University of Rochester, 1973.

Gerald J. Duling, B.S., Xavier University, 1955; M.D., St. Louis University, 1959.

Ira J. Friedman, B.S., University of Arkansas, 1955; M.D., 1960.

Tessa D. Gardner, B.S., Massachusetts Institute of Technology, 1968; M.D., Harvard University, 1972.

Elliot F. Gellman, B.S., State University of Iowa, 1957; M.D., University of Missouri, 1961.

Santosh Gupta, M.B.B.S., Lucknow University, 1963; D.C.H., University of London, 1966.

J. Larry Harwell, A.B., Washington University, 1958; M.D., University of Missouri, 1961.

Henry L. Knock, A.B., Johns Hopkins University, 1949; M.D., 1953.

Stanley B. Lyss, A.B., Harvard University, 1958; M.D., Washington University, 1962.

M. Michael Maurer, B.A., Washington University, 1968; M.D., 1972.

Homer E. Nash, Jr., B.S., Morehouse College, 1948; M.D., Meharry Medical College, 1951.

Paul H. Painter, M.D., St. Louis University, 1947. (See Division of Child Psychiatry.)

Susan Pittman, A.B., University of Missouri, 1959; M.D., 1963.

Steven I. Plax, A.B., University of Missouri, 1957; M.D., 1961.

James R. Rohrbaugh, B.A., Yale University, 1971; M.D., Ohio State University, 1974. (See Department of Neurology and Neurological Surgery.)

William J. Ross, B.A., Miami University, 1968; M.D., Washington University, 1972.

Mary A.T. Tillman, M.D., Howard University, 1960.

George T. Wilkins, Jr., B.S., University of Illinois, 1956; M.D., 1957.

Kathleen Winters, B.S., Winthrop College, 1946; M.D., Medical College of South Carolina, 1955.

Patricia B. Wolff, B.A., University of Minnesota, 1968; M.D., 1972. (See Medical Care Group.)

Gerald Wool, A.B., Princeton University, 1958; M.D., Washington University, 1962.

Instructors

Charlotte L. Barbey-Morel, M.D., University of Geneva, 1976.

Cynthia E. Bearer, B.A., Smith College, 1972; Ph.D., Case Western Reserve University, 1977; M.D., Johns Hopkins University, 1982.

Charles E. Canter, Sc.B., Brown University, 1974; Sc.M., 1976; M.D., St. Louis University, 1979.

Douglas W. Carlson, B.A., Illinois Wesleyan University, 1981; M.D., Southern Illinois University, 1984.

Tattamangalam P. Chandrika, M.S.B.S., Calicut Medical College, 1973.

Barbara A. Cohan, B.A., University of Michigan, 1974; M.D., New York University, 1978.

Michael T. Connor, B.S., Michigan Technological University, 1970; M.D., Wayne State University, 1974. (See Department of Anesthesiology.)

David P. Dempsher, B.S., Washington and Lee University, 1975; M.D., Johns Hopkins University, 1982; Ph.D., 1982.

John Gilster (Dental Medicine), D.D.S., Washington University, 1944.

Joel B. Gunter, B.S., California Institute of Technology, 1978; M.D., University of Oklahoma, 1982. (See Department of Anesthesiology.)

Glen L. Hortin, B.S., Illinois State University-Normal, 1976; M.D., Washington University, 1983; Ph.D., 1983.

Donald V. Huebener (Dental Medicine), D.D.S., Washington University, 1969. (See Department of Radiology.)

Robert M. Kennedy, B.S., Georgia Tech., 1975; M.D., Medical College of Georgia, 1980.

Patricia A. Parsons (Dental Medicine), B.S., San Diego State College, 1953; D.D.S., Washington University, 1957.

Fran L. Porter, B.A., Washington University, 1968; M.A., University of Chicago, 1973; Ph.D., Washington University, 1977.

Robert A. Shalwitz, B.G.S., University of Michigan, 1975; M.S., State University of New York-Buffalo, 1980. (Also Department of Chemistry.)

Susan S. Smith, B.S., Southern Methodist University, 1977; M.D., University of Texas-Houston, 1982. (See Department of Anesthesiology.)

Mehernoor F. Watcha, M.B., B.S., University of Bombay, 1972; M.D., 1973. (See Department of Anesthesiology.)

Instructor Emeritus (Clinical)

Joseph A. Bauer, M.D., Washington University, 1926.

Instructors (Clinical)

Patricia J. Amato, B.S., Notre Dame College, 1979; M.D., Medical College of Ohio, 1982.

Christos A. Antoniou, M.D., University of Athens, 1958.

Jean M. Auguste, B.A., Lycee T. L'Ouverture, 1950; M.D., Medical School of Haiti, 1956.

Bonnie J. Aust, B.A., University of Texas, Austin, 1975; M.D., University of Texas, San Antonio, 1979.

Susan L. Baumer, B.A., University of Oregon, 1969; M.D., University of Pennsylvania, 1975.

Miriam J. Behar, B.A., University of California, 1977; M.D., Johns Hopkins University, 1981.

Robert A. Bergamini, B.S., Rensselaer Polytechnic Institute, 1978; M.D., Albany Medical College, 1978.

Pardeep Bhanot, M.B.B.S., Medical College of Amritsar, 1974.

Leslie G. Biesecker, B.S., University of California, 1979; M.D., University of Illinois, 1983.

Huldah C. Blamoville, B.S., Queens College, 1959; M.D., Meharry Medical College, 1965.

Eyla G. Boies, B.S., College of Idaho, 1974; M.D., Washington University, 1978.

Anita Chacko, M.B.B.S., Kasturba Medical College, 1981.

Margarethe M. Chobanian, A.B., Mount Holyoke College, 1976; M.D., University of Pittsburgh School of Medicine, 1980.

Sarah J. Corriveau, B.A., Kalamazoo College, 1975; M.D., Medical College of Wisconsin, 1979.

John C. Davis, M.D., University of Michigan, 1980.

Ray S. Davis, M.D., University of Louisville, 1978.

Sandra J. Dodson, B.S., Cornell University, 1970; M.D., Northwestern University, 1976.

Terrel L. French, B.A., Occidental College, 1976; M.D., Creighton University, 1983.

Florentina U. Garcia, M.D., University of the Philippines, 1965.

Melanie K. Gilliam, B.S., Georgetown College, 1976; M.D., University of Louisville, 1981.

Joseph K. Goldenberg, B.A., University of Missouri, Kansas City, 1980; M.D., 1980.

Roman E. Hammes, B.A., University of Iowa, 1950; M.D., 1954.

Aaron Hamvas, B.S., Rensselaer Polytechnic Institute, 1977; M.D., Washington University, 1981.

Nancy E. Holmes, B.A., University of Kansas, 1972; M.D., University of Missouri, 1976.

Carl S. Ingber, A.B., University of Rochester, 1968; M.D., Boston University, 1972.

Aidan W. Ip, B.A., University of Chicago, 1975; M.D., 1979.

Joyce D. Johnson, B.S., Oberlin College, 1977; M.D., Case Western Reserve University, 1982.

William L. Johnson, B.S., University of Missouri-Kansas City, 1977; M.D., University of Missouri-Columbia, 1981.

Larry A. Jones, A.B., Johns Hopkins University, 1972; M.D., 1976.

Joseph A. Kahn, A.B., St. Louis University, 1973; M.D., University of Missouri-Columbia, 1977.

Sheldon Kessler, M.D., St. Louis University, 1951.

Shirley M. Knight, B.A., Dillard University, 1976; M.D., Washington University, 1980.

Robert L. Korn, M.D., Washington University, 1949.

Katherine L. Kreusser, B.S., University of Pennsylvania, 1973; M.D., Indiana University, 1978.

Norton S. Kronemer, A.B., Washington University, 1958; M.D., University of Missouri, 1962.

Michael P. Kucera, B.A., Carroll College, 1978; M.D., St. Louis University, 1982.

Leland M. Laycob, A.B., Washington University, 1964; M.D., University of Missouri, 1968.

Richard L. Lazaroff, B.A. Brown University, 1974; M.D., St. Louis University, 1978.

Barry Light, A.B., University of Missouri, Columbia, 1973; Ph.D., 1977; M.D., 1980.

Robert D. Lins, A.B., University of Missouri, 1965; M.D., 1969.

Thomas C. McKinney, B.A., Illinois Wesleyan University, 1976; M.D., Washington University, 1980.

John F. Mantovani, B.A., University of Evansville, 1971; M.D., University of Missouri, 1974. (See Department of Neurology and Neurological Surgery.)

Olin B. Mauldin, B.A., University of Mississippi, Oxford, 1969; M.D., University of Mississippi, Jackson, 1973.

Elaine Miller, A.B., Judson College, 1944; M.D., Medical College of Alabama, 1949.

Susan J. Nelson, A.B., Oberlin College, 1969; M.A., 1971; M.D., Washington University, 1978.

Laura L. Norling, B.A., Spring Arbor College, 1974; M.D., Ohio State University, 1978.

David S. Olander, A.B., Washington University, 1964; M.A., 1965; Ph.D., 1967; M.D., 1974.

Eugenia M. Pierce, M.D., St. Louis University, 1958.

Juanita C. Polito, B.A., University of Dallas, 1975; M.D., Southwestern University, 1979.

Joseph L. Portnoy, M.D., University of Kansas, 1974.

Robert L. Quaas, B.A., Syracuse University, 1965; B.S., University of South Dakota, 1973; M.D., University of Chicago, 1975.

Mohammad H. Rahman, M.B.B.S., University of Karachi, 1960.

Jesse R. Ramsey, B.A., Texas Wesleyan College, 1970; D.O., Texas College of Osteopathic Medicine, 1974.

Martin D. Rudloff, B.A., Central Methodist College, 1977; M.D., Washington University, 1981.

Janet M. Ruzyski, B.A., Washington University, 1977; M.D., 1981.

Richard W. Sato, B.A., Johns Hopkins University, 1973; M.D., Washington University, 1977.

Howard J. Schlansky, B.A., University of Missouri, Kansas City, 1976; M.D., 1978.

Seymour M. Schlansky, M.D., Chicago Medical School, 1950.

Pamela M. Schuler, B.S., University of Michigan, 1979; M.D., 1979.

Jeffrey I. Schulman, B.A., Yale University, 1970; M.D., University of Kentucky, 1974.

Richard M. Schwend, B.A., University of California, 1975; M.D., St. Louis University, 1979.

Norman P. Steele, B.A., Indiana University, Bloomington, 1968; M.D., Indiana University, Indianapolis, 1972.

Robert H. Strashun, B.A., M.A., Yeshiva University, 1978; M.D., New York University, 1982.

Monica H. Ultmann, B.A., Oberlin College, 1975; M.D., Columbia University College of Physicians and Surgeons, 1980.

Orestes S. Valdes, B.S., Instituto de Santa Clara, 1947; M.D., University of Havana, 1954.

Barbara N. Voegel, B.S., University of Illinois, 1950; M.D., Washington University, 1957.

Roger J. Waxelman, A.B., Washington University, 1965; M.D., University of Missouri, 1969.

Jeffrey M. Wright, B.S., Vanderbilt University, 1975; M.D., Washington University, 1979.

H. Benjamin Zwirn, M.D., University of Basel, 1954.

Research Associates

Charles E. Crawford, Jr., B.S., Washington University, 1956; M.S., Lindenwood College, 1983.

Richard E. Hauhart, B.S., University of Missouri, St. Louis, 1969; M.S., 1982.

Charles A. Reed, A.B., Washington University, 1961.

Assistants

Marion H. Baker (Health Services), R.N., St. John's Hospital, 1946; P.N.P., Cardinal Glennon Memorial Hospital for Children, 1973. (See Medical Care Group.)

Susan K. Keating (Health Services), B.S., University of North Carolina School of Nursing, 1965; P.N.P., Washington University, 1970.

Assistants (Clinical)

Juli A. Antonow, B.A., Carleton College, 1972; M.D., University of Minnesota, 1975.

Earl C. Beeks, Jr., B.S., Howard University, 1977; M.D., University of Missouri, Columbia, 1981.

Marietta O. Belen, M.D., Far Eastern University, 1963.

Michele R. Bertram, B.A., Johns Hopkins University, 1977; M.D., Washington University, 1981.

Earline A. Brownridge, B.A., Washington University, 1978; M.D., University of Missouri, Columbia, 1982.

Seth J. Brownridge, B.A., Washington University, 1978; M.D., 1982.

Margaret H. Burroughs, A.B., Mount Holyoke College, 1978; M.D., University of Vermont, 1982.

William T. Chao, B.S., University of Illinois, Urbana, 1975; M.D., University of Illinois, Chicago, 1979.

Darryl S. Cohen, B.A., North Texas State University 1976; D.O., Texas College of Osteopathic Medicine, 1981.

Anna M. Fitz-James, B.A., University of Massachusetts, 1975; M.D., George Washington University, 1981.

Joseph G. Gibbons, B.S., Georgetown University, 1977; M.D., Ohio State University, 1980.

Laura M. Moody, B.S., Carleton College, 1977; M.D., Washington University, 1981.

Jerome H. O'Neil, Jr., B.A., University of Missouri, Columbia, 1977; M.D., St. Louis University, 1981.

Habibur Rahman, M.B.B.S., Dacca University Medical College, 1972.

Sudhir R. Raikar, M.B., University of Bombay, 1969.

Karen L. Remley, B.A., University of Missouri, Kansas City, 1980; M.D., 1980.

Hsin-Chin Shih, M.D., Kaoshiung Medical College, 1964.

Joan L. Snipes, M.D., University of Missouri-Kansas City, 1982.

Nareshkumar Solanki, B.M., B.S., University of Nairobi, 1975.

Robert D. Spewak, B.A., Drake University, 1975; M.D., St. Louis University, 1979.

M. Anne Street, B.A., Defiance College, 1968; M.S., University of Connecticut, 1970; M.D., University of Illinois, 1976.

Garland R. Tschudin, B.A., University of Missouri, Columbia, 1971; M.D., 1975.

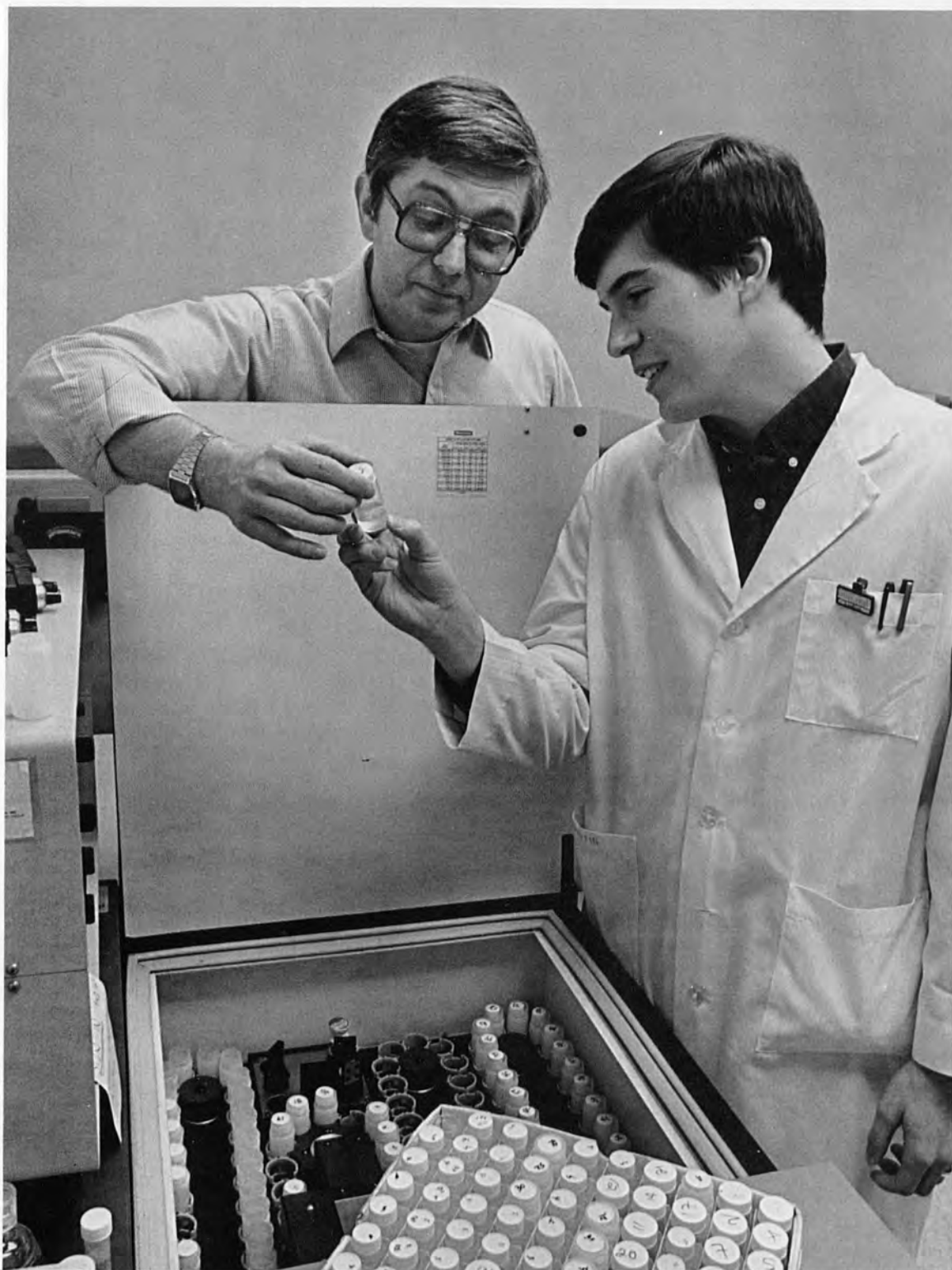
Marc E. Weber, A.B., Franklin and Marshall College, 1979; M.D., University of Tennessee, 1974; J.D., St. Louis University, 1982.

EDWARD

MALLINCKRODT

DEPARTMENT OF

PHARMACOLOGY





PHARMACOLOGY

It is the purpose of the pharmacology course, through discussions of existing drugs, to develop general principles which will be applicable as well to drugs of the future. Pharmacology draws heavily on biochemistry, physiology, and microbiology for an understanding of drug action. It looks toward pathology, medicine, and surgery for its uses.

The laboratory portion of the course is closely coordinated with the lecture material and is designed to demonstrate and emphasize pertinent pharmacological principles and employ agents, equipment, and skills relevant to current medical practice.

A selection of mini-courses (Special Topics), dealing in depth with more advanced concepts of pharmacology and related topics, is integrated into the medical pharmacology course. Small groups of students regularly meet with the faculty to review and discuss the details and interpretation of original literature articles.

SECOND YEAR

Bio 507, 508. Pharmacology

(a) Lectures, conferences, panel discussions. (b) Laboratory course. Credit 7 units for the year.
Dr. Covey and Staff

RESEARCH

Bio 590.

The facilities of the research laboratories are available to those who wish to carry on an original investigation on problems of their own or on those the department is prepared to suggest.

Pharmacology of cardiovascular diseases, especially hypertension; endocrinology of water and electrolyte homeostasis. *Dr. Blaine*

Biosynthesis and processing of placental and pituitary peptide hormones. *Dr. Boime*

Experimental analysis of mechanisms of arrhythmia; electrophysiology; membrane chemistry, and autonomic neural effects. *Dr. Corr*

Preparation and biochemical characterization of mechanism-based inhibitors of steroid biosynthesis; development of anticonvulsant drugs. *Dr. Covey*

The molecular mechanism of volatile anesthetic action studied both biochemically and by NMR spectroscopy. *Dr. Evers*

Neurochemistry of seizures; neuropharmacology of anticonvulsant and psychotropic drugs; functional neuroanatomy of experimental generalized seizures.

Dr. Ferrendelli

Biosynthesis, secretion, and metabolism of atrial natriuretic peptides. *Dr. Geller*

The biosynthesis and chemical and biological characterization of leukotrienes and other arachidonate metabolites. *Dr. Jakschik*

Normal and abnormal development of the sympathetic and sensory nervous system; biology of nerve growth factor (NGF). *Dr. Johnson*

Mechanism of insulin action; neural control of skeletal muscle enzymes. *Dr. Lawrence*

Neurochemistry; regulation of metabolism; quantitative histochemistry; the chemistry of individual human muscle fibers. *Dr. Lowry*

Molecular biology of the development of the nervous system. *Dr. Manning*

Molecular basis of recognition of biological compounds using NMR, analog synthesis, computer modeling, and other methods. *Dr. Marshall*

Metabolic "reflections" of neuronal activity among brain regions in response to various perturbations. *Dr. McDougal*

Synthesis, assembly, and function of the nicotinic acetylcholine receptor. *Dr. Merlie*

Role of membrane lipids on renal epithelial cell function. *Dr. Morrison*

Identification and pharmacological manipulation of intrinsic mediators. *Dr. Needleman*

Regulation and modulation of ion channels by intracellular "second" messengers; design and characterization of photolabile intracellular probes.

Dr. Nerbonne

Study of eicosanoid metabolism of keratinocytes and fibroblasts in normal and diseased skin.

Dr. Pentland

Biology of cytotoxic lymphocytes and mechanisms of immune damage. *Dr. Russell*

Intracellular pathways of ligands and receptors; glycoprotein uptake in liver. *Dr. Schwartz*

ELECTIVES

Descriptions of the following courses are shown in the Division of Biology and Biomedical Sciences:

Bio 509, 510. Current Topics in Pharmacology

Bio 5291. Intracellular Mediators and Regulation of Cellular Function

Bio 5402. Molecular Biology of Transmitters and Receptors

Bio 5461. Molecular Recognition

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.



Faculty

Alumni Professor and Head of Department

Philip Needleman, B.S., Philadelphia College of Pharmacy and Science, 1960; M.S., 1962; Ph.D., University of Maryland, 1964.

Distinguished Professor Emeritus and Lecturer

Oliver H. Lowry, B.S., Northwestern University, 1932; Ph.D., University of Chicago, 1937; M.D., 1937.

Professor Emeritus

F Edmund Hunter, Jr., B.S., Mount Union College, 1938; Ph.D., University of Rochester, 1941.

Professors

Irving Boime, B.S., St. Louis College of Pharmacy, 1964; M.S., Purdue University, 1966; Ph.D., Washington University, 1970. (See Department of Obstetrics and Gynecology.)

James A. Ferrendelli, A.B., University of Colorado, 1958; M.D., 1962. (See Departments of Neurology and Neurological Surgery and Ophthalmology.)

Eugene M. Johnson, Jr., B.S., University of Maryland, 1966; Ph.D., 1970.

David B. McDougal, Jr., A.B., Princeton University, 1945; M.D., University of Chicago, 1947.

Garland R. Marshall, B.S., California Institute of Technology, 1962; Ph.D., Rockefeller University, 1966. (See Department of Biological Chemistry.)

John P. Merlie, B.S., Villanova, 1967; Ph.D., University of Pennsylvania, 1973.

Aubrey R. Morrison (Burroughs Wellcome Clinical Pharmacology Scholar), M.B., B.S., University of London, 1970. (See Department of Medicine.)

Alan L. Schwartz, A.B., Case Western Reserve, 1970; Ph.D., 1974; M.D., 1976. (See Department of Pediatrics.)

Associate Professors

Peter B. Corr, B.S., Union University, 1971; Ph.D., Georgetown University, 1975. (See Department of Medicine.)

Douglas F. Covey, B.S., Loyola College, 1967; M.A., Johns Hopkins University, 1969; Ph.D., 1973.

David M. Geller, B.A., Amherst College, 1952; Ph.D., Harvard University, 1957.

John C. Lawrence, Jr., A.B., Duke University, 1971; Ph.D., University of Virginia, 1978.

John H. Russell, B.S., Juniata College, 1968; Ph.D., Washington University, 1974.

Assistant Professors

Alex S. Evers, B.S., Yale University, 1974; M.D., New York University, 1978. (See Department of Anesthesiology.)

Jeanne M. Nerbonne, B.S., Framingham State College, 1974; Ph.D., Georgetown University, 1978.

Research Associate Professor

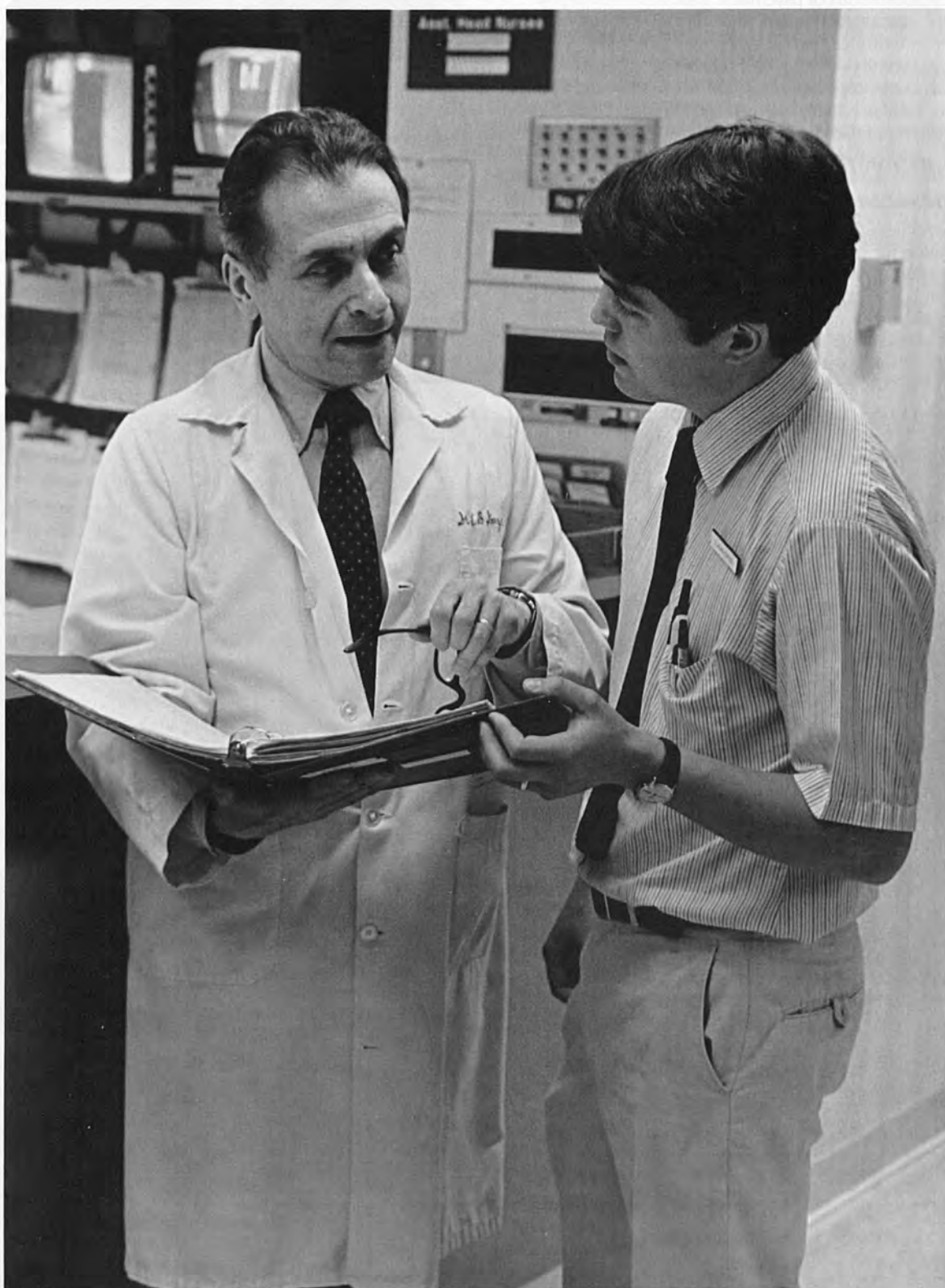
Sr. Barbara A. Jakschik, B.S., Duquesne University, 1963; M.S., 1965; Ph.D., Washington University, 1974.

Adjunct Assistant Professors

Edward H. Blaine, M.A., University of Missouri-Columbia, 1967; Ph.D., 1970.

Pamela T. Manning, B.S., Wright State University, 1973; M.S., 1975; Ph.D., Ohio State University, 1980.

DEPARTMENT OF PSYCHIATRY



PSYCHIATRY

Instruction in psychiatry is given in the last three years of the medical course. Emphasis is on teaching psychiatry as a medical discipline, including the biological, social, and psychological mechanisms and manifestations of psychiatric illness, as well as psychological reactions to other illnesses. Recognition of current limitations of knowledge combined with an appreciation of what is known leads to a spirit of constructive skepticism. This attitude permits the student to study psychiatry in depth and broadly without preconceived theories.

SECOND YEAR

Introduction to Clinical Psychiatry

Emphasis is upon (a) effective interviewing in preparation for medical history taking, (b) evaluation of behavioral and emotional factors in patients with various kinds of illnesses, (c) the diagnosis and natural history of the major psychiatric disorders, (d) critical evaluation of conceptual and methodologic problems in psychiatry and psychology. Lectures, demonstration interviews, discussions. *Dr. Cloninger and Staff*

THIRD YEAR

Psychiatry Clerkship

Students in groups of about 15 spend six weeks on the inpatient services of Barnes, Jewish, and Bliss Hospitals. *Dr. Rubin and Staff*

FOURTH YEAR

"A" Electives

(A) Human Sexuality. Human sexuality is a 19-hour practical introduction to human sexual function and dysfunction encountered in practice. Lectures and small group discussions are designed to increase physicians' comfort with and tolerance of sexual topics in the clinical setting. As part of the core curriculum of the second year, the course is offered as an "A" elective to a limited number of fourth-year students. (See course schedule for lecture times.) *Dr. G. Murphy*

(B) Psychoanalysis. Introduction to Psychoanalytic Theory and its application to medicine and psychiatry: the psychoanalytic theory of personality will be discussed in a seminar in which the clinical practice aspects of the theory would be related to clinical medicine and psychiatry. A bibliography will be distributed and reading of basic books encouraged. Clinical material will be used to demonstrate the psychoanalytic theory and its applications. Seminars will be held in the Psychoanalytic Institute Building, 4524 Forest Park, Room 10. *Dr. A. Kaplan*

"B" Electives

(A) Outpatient and Community Psychiatry. This is a flexible clerkship tailored to the student's interests. Adult psychiatric patients in the Washington University



Psychiatric Clinic present a variety of psychological and interpersonal problems similar to those encountered in the office practice of a psychiatrist, an internist, or a family physician. Students have an opportunity to learn a variety of treatment techniques under supervision.

Students also manage patients in a community mental health center located in an inner-city area. There, students see how psychiatry works with social agencies, schools, and other institutions utilizing paramedical personnel in the detection and treatment of mental illness. *Dr. Smith*

(B) Clinical Psychiatry in Barnes Hospital. This is a fourth-year elective providing the student with an opportunity to learn clinical psychiatry by functioning as an extern on a six-week rotation. The student participates in a role similar to that of a first-year resident and attends all rounds and conferences for first-year psychiatry residents. The student takes night call approximately every fifth or sixth night. Supervision is by the chief resident and the director of the inpatient service. This rotation is particularly desirable for students going into family practice, general internal medicine, general pediatrics, or other nonpsychiatry specialties. The rotation provides an excellent opportunity to learn firsthand about psychiatric diagnosis, psychopharmacology, community resources, familial interventions, and further insights into the current literature. *Dr. Kneesevich*

(C) Child Psychiatry, Children's Hospital, and the Washington University Child Guidance Clinic. This clerkship in child psychiatry gives students an appreciation of the intricacies of diagnosis and treatment of emotionally disturbed children. The clerkship in-

volves working up a small number of preadolescent as well as adolescent children under the supervision of senior staff members. Didactic teaching is available, as well as individual supervision of patients. Students gain an appreciation of both drug treatment and the limitations of drug treatment. They are exposed to the roles of community agencies such as settlement houses, juvenile courts, and various private agencies with which a child psychiatrist must work. Students also gain appreciation of the roles of nurse, social worker, teacher, and occupational therapist in collaboration with individuals of these disciplines.

Dr. F. Earls

RESEARCH

Emphasis is on anatomy and function of biochemically defined neuron systems in the CNS: 1) Immunohistochemical localization of enzymes involved in biosynthesis and degradation of biogenic amines and acetylcholine. 2) Neurogenic and pharmacologic regulation of vascular permeability and blood flow. 3) Measurement of brain proteins in plasma during neurological disease. *Dr. B. Hartman*

Our research concerns the mechanisms and actions of excitotoxic amino acids such as glutamate

(Glu), aspartate, and kainate in the central nervous system. It ranges from human studies of Chinese Restaurant Syndrome to basic animal studies of Glu roles in neurotransmission, endocrinology, neuropathology, and development. Our techniques include neurohistopathological methods, such as electron microscopy, autoradiography, and immunohistochemistry as well as neurochemical methods such as radioimmunoassay and receptor binding and reuptake studies.

Drs. Olney and M. Price

Our investigations in psychiatric genetics attempt to understand the familial aggregation of the major psychiatric illnesses. We aim to characterize complex mechanisms of transmission and to localize abnormal genes using DNA Restriction Fragment Length Polymorphisms as linkage markers. A broad range of research opportunities are available, such as locating and interviewing families participating in genetic studies and working in a genetics lab. Laboratory techniques include the formation and culture of lymphoblastoid cell lines; DNA extraction; and the detection of DNA polymorphisms. Psychiatric disorders under study include schizophrenia; biopolar manic depressive illness; and alcoholism. *Dr. Reich*



Faculty

Spencer T. Olin Professor and Head of Department

Samuel B. Guze, M.D., Washington University, 1945. (See Administration and Department of Medicine.)

Wallace Renard Professor

Eli Robins, A.B., Rice University, 1940; M.D., Harvard University, 1943.

Professor Emeritus

Saul Rosenzweig (Medical Psychology), A.B., Harvard University, 1929; M.A., 1930; Ph.D., 1932. (Also Department of Psychology.)

Professors

Theodore J. Cicero

(Neuropharmacology), B.S., Villanova University, 1964; M.S., Purdue University, 1966; Ph.D., 1968. (See Department of Anatomy and Neurobiology.)

C. Robert Cloninger, B.A., University of Texas, 1966; M.D., Washington University, 1970; M.D. (hon.), Umea University, Sweden, 1983. (See Department of Genetics.)

John E. Helzer, M.D., University of Utah, 1967.

Blake W. Moore (Biochemistry), B.S., University of Akron, 1948; Ph.D., Northwestern University, 1952. (See Department of Biological Chemistry.)

George E. Murphy, B.S., Oregon State College, 1949; M.D., Washington University, 1952.

John W. Olney, B.A., Iowa University, 1956; M.D., 1963. (See Department of Pathology.)

Dabeeru C. Rao (Biostatistics), B.S., Indian Statistical Institute, 1967; M.S., 1968; Ph.D., 1971. (See Department of Genetics and Division of Biostatistics.)

Theodore Reich, B.S., McGill University, 1959; M.D., 1963. (See Department of Genetics.)



John P. Rice (Mathematics), B.A., Cornell University, 1969; M.A., Washington University, 1972; Ph.D., 1975. (See Division of Biostatistics.)

Lee N. Robins (Sociology), B.A., Radcliffe College, 1942; M.A., 1943; Ph.D., 1951. (Also Faculty of Arts and Sciences.)

William R. Sherman (Biochemistry), A.B., Columbia University, 1951; Ph.D., University of Illinois, 1955. (See Department of Biological Chemistry.)

Brian K. Suarez (Genetics), B.A., San Fernando Valley State College, 1967; M.A., University of California-Los Angeles, 1972; Ph.D., 1974. (See Department of Genetics.)

Richard D. Wetzel (Medical Psychology), B.A., Concordia College, 1959; B.D., Concordia Seminary, 1963; Ph.D., St. Louis University, 1974.

Research Professor

Mitchell Taibleson (Mathematics), S.M., University of Chicago, 1960; Ph.D., 1962. (Also Faculty of Arts and Sciences.)

Professors Emeriti (Clinical)

Margaret C. L. Gildea, B.S., University of Chicago, 1923; M.D., Yale University, 1936.

Sydney B. Maughs, A.B., Westminster College, 1931; M.D., Washington University, 1935.

Professors (Clinical)

Richard W. Hudgens, B.A., Princeton University, 1952; M.D., Washington University, 1956.

Alex H. Kaplan, B.S., College of City of New York, 1932; M.D., St. Louis University, 1936.

Patricia L. O'Neal, A.B., Washington University, 1944; M.D., 1948.

Associate Professor

Mary L. Carlson (Neurobiology), B.S., University of Wisconsin, 1961; M.A., Northwestern University, 1964; Ph.D., Tulane University, 1967. (See Department of Anatomy and Neurobiology.)

Research Associate Professor

Madelon T. Price (Neurobiology), A.B., Washington University, 1953; Ph.D., 1973.

Associate Professors (Clinical)

John T. Biggs, Jr., A.B., Drury College, 1963; M.S., University of Tennessee, 1965; M.D., 1968.

Jack L. Croughan, B.A., University of Kansas, 1964; M.D., Kansas University, 1968.

Robert S. Hicks, A.B., Hendrix College, 1951; M.D., University of Arkansas, 1958.

Edward H. Kowert, A.B., Washington University, 1940; M.D., 1943. (Malcolm Bliss Hospital.)

Wanda M. Lamb, B.S., University of Missouri, 1946; M.D., Washington University, 1948.

Jay L. Liss, A.B., Washington University, 1962; M.D., 1966.

Joe K. McKinney, B.A., Westminster College, 1954; M.D., Washington University, 1958.

Jay Meyer, A.B., Washington University, 1956; M.D., St. Louis University, 1960.

Paul M. Packman, A.B., Washington University, 1959; M.D., 1963.

Thomas F. Richardson, B.A., Millikin University, 1959; M.D., Washington University, 1963.

Marcel T. Saghir, B.Sc., American University of Beirut, 1959; M.D., 1963.

E. Robert Schultz, A.B., Southeast Missouri State College, 1952; B.S.Med., University of Missouri, 1953; M.D., Washington University, 1955. (See Department of Neurology and Neurological Surgery.)

James B. Smith, A.B., University of Missouri, 1963; M.D., 1967.

Harold D. Wolff, A.B., Washington University, 1952; B.S., University of Missouri, 1953; M.D., State University of Iowa, 1955.

Assistant Professors

Robert M. Carney (Medical Psychology), B.A., University of Missouri, St. Louis, 1969; M.S., Eastern Kentucky University, 1972; Ph.D., Washington University, 1978.

Kenneth E. Freedland (Medical Psychology), B.S., University of Oregon, 1975; M.A., University of Hawaii, 1979; Ph.D., 1982.

Terry A. Fuller, B.S., University of Notre Dame du Lac, 1970; M.D., Washington University, 1974.

Barry A. Hong (Medical Psychology), B.A., Concordia Senior College, 1969; M.Div., Concordia Seminary, 1972; Ph.D., St. Louis University, 1978.

Keith E. Isenberg, B.A., Wabash College, 1974; M.D., Indiana University, 1978.

John W. Kneesevich, A.B., Indiana University, 1971; M.D., McGill University, 1974.

Collins E. Lewis, B.A., Rutgers University, 1967; M.D., Harvard University, 1971; M.P.H., 1975.

Bruce L. Nock (Neurobiology), B.A., Elizabethtown College, 1969; M.A., Bucknell University, 1975; Ph.D., Rutgers University, 1980. (See Department of Anatomy and Neurobiology.)

Eric M. Reiman, B.S., Duke University, 1977; M.D., 1980.

Eugene H. Rubin, B.A., University of Rochester, 1971; M.D., Ph.D., Washington University, 1978.

Charles F. Zorumski, B.A., St. Louis University, 1974; M.D., 1978. (See Department of Neurology and Neurological Surgery.)

Research Assistant Professors

David I. Carroll (Analytical Instrumentation), B.A., Syracuse University, 1958. (See Department of Medicine.)

Bruce A. Crosson (Medical Psychology), B.A., Southern Methodist University, 1972; M.A., 1974; Ph.D., Texas Tech University, 1978. (See Department of Neurology and Neurological Surgery.)

Eric J. Devor (Genetics), B.S., University of New Mexico, 1972; M.S., 1977; Ph.D., 1979.

Patricia L. Faris (Neuroscience), B.S., Missouri Valley College, 1978; Ph.D., Rutgers University, 1983.

Ruth L. Fischbach (Sociology), B.S., Cornell University, 1963; M.S., Boston University, 1975; Ph.D., 1983. (See Department of Medicine.)

Paul P. Hipps (Biochemistry), B.S., Lakeland College, 1966; Ph.D., North Dakota State University, 1971.

Michael P. Honchar (Neurochemistry), B.A., Washington University, 1968; Ph.D., 1976.

Lynn H. O'Connor (Neuroendocrinology), B.A., Queens College, 1975; Ph.D., Rutgers University, 1983.

Elizabeth M. Smith (Social Work), B.A., University of Nebraska, 1960; M.S.W., 1962; Ph.D., Washington University, 1978.

Paul Van Eerdewegh (Mathematics), B.S., Free University of Brussels, 1970; M.S., 1972; Ph.D., Washington University, 1982.

Assistant Professors Emeriti (Clinical)

Robert M. Bell, M.D., St. Louis University, 1928.

Hyman H. Fingert, B.A., State University of Iowa, 1931; M.D., 1934.

Reese H. Potter, A.B., University of Kansas, 1931; B.S., University of Missouri, 1933; M.D., Washington University, 1935.

Assistant Professors (Clinical)

Bernardo G. Aleksander, M.D., University of Buenos Aires, 1959. (Malcolm Bliss Hospital.)

Ahmad Ardekani, M.D., Pahlavi University, 1974.

William W. Clendenin, M.D., University of Tennessee, 1963.

Bun Tee Co, Jr., B.S., University of Santo Tomas, 1963; M.D., 1967. (Malcolm Bliss Hospital.)

Juan C. Corvalan, M.D., Argentina National University, 1965.

Alejandro M. Datuin, A.A., University of Santo Tomas, 1951; M.D., 1965. (Malcolm Bliss Hospital.)

Mary Davis, B.A., Ohio State University, 1947; M.D., Washington University, 1952.

Plaridel C. Deza, M.D., University of Santo Tomas, 1956. (Malcolm Bliss Hospital.)

Fred W. Gaskin, B.S., University of Minnesota, 1966; M.D., 1968.

Julian C. Hall (Social Work), B.S., University of Louisville, 1949; M.S., 1951; D.S.W., Washington University, 1968. (Malcolm Bliss Hospital.)

Natarajan Lakshminarayanan, M.B., University of Madras, 1960; M.S., 1960; M.D., 1967. (Malcolm Bliss Hospital.)

Patrick J. Lustman (Medical Psychology), B.S., University of Illinois, 1972; M.S., University of Wisconsin, 1974; Ph.D., Michigan State University, 1980.

Lynn J. McLaughlin (Medical Psychology), B.A., Gonzaga University, 1965; M.S., St. Louis University, 1968; Ph.D., 1972. (Malcolm Bliss Hospital.)

Mary A. Montgomery, A.B., Vassar College, 1967; M.D., Northwestern University, 1973.

Rashmi R. Nakra, M.B.B.S., Lady Hardinge, 1970.

William M. Riedesel II, A.B., University of Rochester, 1968; M.D., Cornell University, 1973.

Jo-Ellyn M. Ryall, B.A., Rutgers University, 1971; M.D., Washington University, 1975.

Paul W. Sheffner, B.A., Wabash College, 1970; M.D., Washington University, 1974.

Reed E. Simpson, B.A., Wabash College, 1972; M.D., Washington University, 1976. (Malcolm Bliss Hospital.)

Wayne A. Stillings, B.A., Oberlin College, 1971; M.D., Washington University, 1975.

Richard H. Sundermann, Jr., B.A., Vanderbilt University, 1975; M.D., Washington University, 1979.

Leonard J. Wiedersheim, A.B., Washington University, 1943; M.D., 1946.

Edwin D. Wolfgram, B.A., State University of Iowa, 1954; M.D., 1959.

Instructors

David M. Connor, B.A., University of Oklahoma, 1979; M.D., 1983.

Stephen H. Dinwiddie, B.S., College of William and Mary, 1977; M.S., Medical College of Virginia/Virginia Commonwealth University, 1979; M.D., Eastern Virginia Medical School, 1982.

Wayne C. Drevets, B.S., Wheaton College, 1979; M.D., University of Kansas, 1983.

Terrence S. Early, B.S., Northeast Missouri State University, 1977; M.D., Duke University, 1982.

William C. Friend, B.S., University of Toronto, 1975; M.S., 1977; M.D., McGill University, 1983.

David J. Goldmeier, A.B., Dartmouth College, 1978; M.D., Washington University, 1982.

Mary Ann Knesevich, B.A., Indiana University, 1975; M.D., 1981.

Jose V. Pardo, B.S., University of Miami, 1975; M.D., Ph.D., Johns Hopkins University, 1982.

Research Instructor

Juanita L. Carl (Biochemistry), B.S., Drury College, 1959; A.M., Washington University, 1962.

Instructors (Clinical)

Dale J. Anderson, B.S., Oberlin College, 1975; M.D., Washington University, 1979.

Michael T. Armour (Medical Psychology), B.A., Quincy College, 1972; M.A., Southern Illinois University, 1976; Ph.D., Purdue University, 1984.

Anna K. Bradley (Social Work), B.J., University of Missouri, 1956; M.S.W., Washington University, 1958. (Malcolm Bliss Hospital.)

Barbara L. Dancy (Medical Psychology), B.S.N., Southern Illinois University, 1969; M.S.N., University of Illinois, 1972; M.S.(R), St. Louis University, 1979; Ph.D., 1981. (Malcolm Bliss Hospital.)

Pacita Dy, A.A., University of the East, 1959; M.D., Far Eastern University, 1967. (Malcolm Bliss Hospital.)

Ranendra Ghosh, M.B.B.S., Patna Medical College, 1947. (Malcolm Bliss Hospital.)

Menachem Givon (Medical Psychology), B.A., The Hebrew University in Jerusalem, 1964; M.A., Southern Illinois University, 1968; Ph.D., 1970. (Malcolm Bliss Hospital.)

Sonya N. Joseph, M.D., Cairo University, 1964. (Malcolm Bliss Hospital.)

F Timothy Leonberger (Medical Psychology), B.A., University of Illinois, 1977; M.S., Northwestern State University, 1983; Ph.D., University of Southern Mississippi, 1986. (Malcolm Bliss Hospital.)

Judith A. McGee (Medical Psychology), B.A., Long Island University, 1969; M.S., St. Louis University, 1975; Ph.D., 1979. (Malcolm Bliss Hospital.)

Virgil L. Malmberg, B.S., University of Illinois, 1968; M.S., 1970; M.D., University of Missouri, 1978.

James R. Mikolajczak, B.S., St. Louis University, 1968; M.D., 1972.

John F. Mueller (Social Work), B.S., Washington University, 1947; M.S.W., 1952. (Malcolm Bliss Hospital.)

Robin S. Puder (Medical Psychology), B.A., Wesleyan University, 1979; M.A., Washington University, 1982; Ph.D., 1985. (Malcolm Bliss Hospital.)

Mary M. Randlett (Medical Psychology), B.A., University of Toledo, 1968; M.A., University of Missouri, 1970; Ph.D., Iowa State University, 1978. (Malcolm Bliss Hospital.)

Dean L. Rosen (Medical Psychology), B.S., University of Iowa, 1968; Psy.D., University of Illinois, 1977. (Malcolm Bliss Hospital.)

Jonathan D. Rosenboom (Medical Psychology), B.A., Sterling College, 1976; M.S., Fort Hays State University, 1978; Ph.D., Baylor University, 1984. (Malcolm Bliss Hospital.)

James L. Rutherford, B.A., Drake University, 1975; M.D., University of Iowa, 1980.

Luzviminda Santos, M.D., University of Santo Tomas, 1968. (Malcolm Bliss Hospital.)

Robert K. Shaw (Medical Psychology), B.A., University of Texas at Austin, 1975; M.A., University of Missouri, 1983; Ph.D., 1984. (Malcolm Bliss Hospital.)

Lecturers

Virginia Johnson-Masters (Human Sexuality), D.Sc. (hon.), University of Louisville, 1978.

William H. Masters (Human Sexuality), B.S., Hamilton College, 1938; M.D., Rochester University, 1943; Sc.D. (hon.), Hamilton College, 1973. (See Department of Obstetrics and Gynecology.)

Michael Merbaum (Medical Psychology), B.A., Drake University, 1956; M.A., University of Missouri, 1957; Ph.D., University of North Carolina, 1961. (Also Department of Psychology.)

WILLIAM GREENLEAF ELIOT DIVISION OF CHILD PSYCHIATRY

The Division of Child Psychiatry offers a varied teaching program for medical students, residents in psychiatry, and fellows in child psychiatry at Children's Hospital. Outpatient services are organized through

the Child Guidance Center located in Children's Hospital and inpatient services are provided through a 16-bed psychiatric unit. Active consultation with all medical and surgical units of the hospital is also maintained. Trainees are assigned to these various services, where they participate in diagnostic evaluations and see patients in treatment under supervision.

Director and Blanche F. Ittleson Professor

Felton J. Earls (Child Psychiatry), B.S., Howard University, 1963; M.D., 1967. (See Department of Pediatrics.)

Professor Emeritus

E. James Anthony (Child Psychiatry), B.S., University of London, 1938; M.R.C.S., L.R.C.P., 1941; M.B., B.S., 1942; D.P.M., 1947; M.D., 1949.

Associate Professor

Zila Welner (Child Psychiatry), M.D., Hebrew University Hadassah Medical School, 1961. (See Department of Pediatrics.)

Associate Professor (Clinical)

Haruo Kusama (Child Psychiatry), A.B., Washington University, 1960; M.D., 1965.

Assistant Professor Emeritus

Loretta K. Cass Seleski (Medical Psychology), B.A., Colorado College, 1934; M.A., 1942; Ph.D., Ohio State University, 1950.

Assistant Professors

Richard D. Todd (Child Psychiatry), B.A., Vanderbilt University, 1974; Ph.D., University of Texas, 1977; M.D., 1981.

Michele Van Eerdewegh (Child Psychiatry), M.D., Free University of Brussels, 1970.

Abby L. Wasserman (Child Psychiatry), A.B., Johns Hopkins University, 1967; M.D., 1970. (See Department of Pediatrics.)

Research Assistant

Professors

Gwendolyn G. Reich

(Anthropology Child Psychiatry),
B.A., McGill University, 1962; M.A.,
Washington University, 1969; Ph.D.,
1978.

Arlene R. Stiffman (Social Work
Child Psychiatry), B.A., University
of Cincinnati, 1963; M.S.W.,
Washington University, 1975; Ph.D.,
1980.

Assistant Professors

(Clinical)

James E. Edwards (Child
Psychiatry), B.A., University of
Tennessee, 1959; M.D., 1962.

Paul H. Painter (Child Psychiatry),
M.D., St. Louis University, 1947.
(See Department of Pediatrics.)

Adolfo E. Rizzo (Child Psychiatry),
M.D., Buenos Aires University,
1955.

Instructor Emeritus

Louetta Berger (Psychiatric Social
Work), B.S., University of Wichita,
1941; M.S.W., Washington
University, 1946.

Instructor

Jeffrey A. Smith (Medical
Psychology Child Psychiatry), B.A.,
State University of New York at
Stony Brook, 1979; M.A.,
Washington University, 1982; Ph.D.,
1984.

Instructors (Clinical)

Joshua W. Calhoun (Child
Psychiatry), B.A., Yale College,
1978; M.D., University of
Cincinnati, 1982.

Vinod Suri, M.D., Punjab University,
1962. (Hawthorn Children's
Psychiatric Hospital.)

DEPARTMENT OF RADIOLOGY



RADIOLOGY

The Department of Radiology is located primarily in the thirteen-story Mallinckrodt Institute of Radiology, but also occupies space in the West Pavilion and Queeny Tower of Barnes Hospital, Barnard Hospital, Wohl Hospital, the Clinical Sciences Research Building, Children's Hospital, the East Building on Scott Avenue, and the 4511 Forest Park facility. The department provides diagnostic radiology, nuclear medicine, radiation physics, and/or radiation oncology services to Barnes, Jewish, and Children's Hospitals.

Clinical facilities for the Radiation Oncology Center are located on the ground and first floors of the Institute, in Barnard Hospital, and in the West Pavilion. Therapy equipment consists of advanced 20, 6, and 4 MV linear accelerators, the most recent addition, the Clinac 1800 linear accelerator, and Cobalt 60 therapy. Also available are facilities and an ample stock of Cesium 137 sources for both interstitial and intracavity therapy and advanced equipment for interstitial and external hyperthermia.

The first floor of the Institute houses administrative offices, a film library, the reception and scheduling area, consulting viewing rooms, and the 150-seat Scarpellino Auditorium.

Seventy-four examination rooms for diagnostic radiology are available in the Institute, Queeny Tower, West Pavilion, Wohl Hospital, the East Building, and Children's Hospital. Institute clinical facilities are located on the second floor (chest, musculoskeletal radiology, and mammography); third floor (neuroradiology; digital vascular imaging, computed head tomography, and genitourinary radiology); fourth floor (gastrointestinal radiology, ultrasound, and computed body tomography); and the fifth floor (magnetic resonance imaging and computed body tomography). A clinical facility for positron emission tomography (PET) is currently being constructed on the seventh floor. Cardiovascular radiology and the Division of Nuclear Medicine are located on the ninth floor of the West Pavilion. The tenth floor of the West Pavilion is dedicated entirely to outpatient radiologic services. Orthopedic x-ray facilities are located on the eleventh floor of the West Pavilion and in the Wohl Clinic, and there are four radiologic examination rooms within the Barnes Emergency Department. In the north wing of Children's Hospital, the first floor houses a complete pediatric radiology facility offering ultrasound, nuclear medicine, computed tomography, and cardiac catheterization. The modern features of the Institute include six CT scanners, three digital subtraction systems, and two magnetic resonance imaging systems.

The sixth floor of the Institute contains the Division of Radiation Sciences which utilizes a PET imaging system and two medical cyclotrons in Barnard Hospital. Additional research facilities are located on the third (hyperthermia) and sixth (physics) floors of Bar-



nard Hospital, the 4511 Forest Park facility (cancer biology), the Clinical Sciences Research Building (radiation oncology, radiation sciences, nuclear medicine, and computer science), and the East Building (magnetic resonance imaging).

Administrative, teaching, and support functions occupy the eighth through eleventh floors of the Institute. The twelfth floor is occupied by sophisticated computer facilities that are utilized for clinical, research, and teaching applications.

The undergraduate teaching program is designed to present both diagnostic and therapeutic radiology to students as part of the clinical clerkship experience. Every effort is made to provide an opportunity to correlate radiologic and clinical findings through interdepartmental conferences, consultations, and group discussions.

SECOND YEAR

Twenty hours of lecture are devoted to an introduction to radiology. The majority of the course is devoted to diagnostic radiology including computed tomography, ultrasound, and nuclear medicine. Radiation biology and radiation oncology are also introduced.

ELECTIVES

Research Electives

Opportunities are available to carry out research in the laboratories under the guidance of the staff in the fields of diagnostic radiology, therapeutic radiology, radiation physics, and nuclear medicine.

Dr. Dixie Anderson

Summer Oncology Clerkship for First-Year Students

A ten-week summer clerkship program is available for first-year medical and dental students. The students participate in the clinical activities of the Division of Radiation Oncology and are exposed to the fundamental concepts of cancer biology and clinical radiation therapy in a series of lectures, seminars, and case presentation conferences. They have the opportunity to conduct some laboratory research or clinical investigation under the direction of the staff members of the sections of Clinical Radiation Oncology and Cancer Biology. *Drs. Simpson and Perez*

FOURTH YEAR ELECTIVES

Clerkship in Radiation Oncology

A six-week elective in which the student has the opportunity to see patients being evaluated and treated in Radiation Oncology. Emphasis is on techniques of cancer diagnosis and localization, selection of therapy, indications for irradiation and techniques on treatment planning, simulation, and irradiation of a variety of tumors. There are several conferences in which the students participate, including new case-planning conferences, a clinical physics conference, a protocol conference, and interdepartmental conferences with the departments of Pediatrics, Obstetrics and Gynecology, Surgery, and Pathology. *Drs. Kuske or Perez*

Radiology Electives—Mallinckrodt Institute

The role of radiology in the solution of clinical diagnostic problems is emphasized in this clerkship. Each student on the rotation will spend one or two weeks on each of two or three subspecialty sections within the department (abdomen, bone and joint, cardiac, chest, neuroradiology, nuclear medicine, pediatric radiology, radiation oncology, and cross-sectional imaging) under the supervision of a senior faculty member. The student will have a chance to observe special procedures as well as routine radiological examinations. Conferences intended to complement the subspecialty approach to radiology round out this experience.

Dr. Dixie Anderson

Clerkships in diagnostic radiology are also offered at Jewish Hospital (*Dr. Hyman Senturia*) and St. Luke's Hospital (*Dr. Mayes*).

Clinical Nuclear Medicine

A six-week elective in which the student will be exposed to the full range of techniques, including organ imaging with radionuclides, nuclear hematology, *in vitro* tests, and radionuclide therapy. The student will be responsible for planning appropriate isotope studies in patients referred to the department in conjunction with the staff. Opportunity exists to learn instrumental techniques, including new ones such as computer applications. Participation in clinical and laboratory research projects may also be arranged if desired. There are daily conferences and scan interpretation sessions. *Dr. B. Siegel*

Faculty

Elizabeth E. Mallinckrodt Professor and Head of Department and Director of the Mallinckrodt Institute of Radiology

Ronald G. Evens, A.B., Washington University, 1961; M.D., 1964.

Professors

James P. Crane, B.A., Indiana University, 1966; M.D., 1970. (See Departments of Genetics and Obstetrics and Gynecology.)

Bahman Emami, M.D., Tehran University, 1968.

Mokhtar Gado, M.B., B.Ch., Cairo University, 1953; DMRE, 1960. (See Department of Neurology and Neurological Surgery.)

Louis A. Gilula, M.D., University of Illinois, 1967.

Robert L. Grubb, Jr. (Radiation Sciences), A.B., University of North Carolina, 1961; M.D., 1965. (See Department of Neurology and Neurological Surgery.)

Fred J. Hodges III, B.A., University of Wisconsin, 1944; M.D., 1946.

R. Gilbert Jost, A.B., Harvard University, 1964; M.D., Yale University, 1969. (Also School of Engineering and Applied Science, Department of Computer Science.)

Joseph K. T. Lee, B.Sc., Chinese University of Hong Kong, 1968; M.D., Washington University, 1973.

Hsiu-san Lin, M.D., Taiwan University, 1960; Ph.D., University of Chicago, 1968. (See Department of Microbiology and Immunology.)

Philip A. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Medicine.)

William H. McAlister, B.S., Wayne State University, 1950; M.D., 1954. (See Department of Pediatrics.)

Bruce L. McClennan, B.S., Union College, 1963; M.D., State University of New York, Upstate, 1967.

G. Leland Melson, B.A., Ottawa University, 1961; M.D., Washington University, 1965.

William A. Murphy, Jr., B.S., University of Pittsburgh, 1966; M.D., Pennsylvania State University, 1971.

Carlos A. Perez, B.S., University of Antioquia, 1952; M.D., 1960.

James A. Purdy (Radiation Physics), B.S., Lamar University, 1967; M.A., University of Texas, 1969; Ph.D., 1971.

Marcus E. Raichle (Radiation Sciences), B.S., University of Washington, 1960; M.D., 1964. (See Department of Neurology and Neurological Surgery.)

Stuart S. Sagel, B.A., Temple University, 1961; M.D., 1965.

Gary D. Shackelford, B.A., Northwestern University, 1964; M.D., Washington University, 1968. (See Departments of Pediatrics and Pharmacology.)

Barry A. Siegel, A.B., Washington University, 1965; M.D., 1969. (See Department of Medicine.)

Michel M. Ter-Pogossian (Radiation Sciences), B.A., University of Paris, 1943; M.S., Washington University, 1948; Ph.D., 1950. (Also School of Engineering and Applied Science, Biomedical Engineering Program.)

Leonard J. Tolmach (Radiation Biology), B.S., University of Michigan, 1943; Ph.D., University of Chicago, 1951.

Teresa J. Vietti (Radiation Oncology), A.B., Rice University, 1949; M.D., Baylor University, 1953. (See Department of Pediatrics.)

Todd H. Wasserman, A.B., University of Rochester, 1968; M.D., University of Rochester School of Medicine and Dentistry, 1972.

Michael J. Welch (Radiation Chemistry), B.A., Cambridge University, 1961; M.A., 1964; Ph.D., University of London, 1965. (Also Faculty of Arts and Sciences, Department of Chemistry.)

Professor Emeritus (Clinical)

Hyman R. Senturia, A.B., Washington University, 1929; M.D., 1933.

Associate Professors

Dixie J. Anderson, B.A., Hendrix College, 1967; M.D., Washington University, 1971.

Dennis M. Balfe, B.S., University of Santa Clara, 1968; M.D., Medical College of Wisconsin, 1975.

Ralph V. Clayman, B.S., Grinnell College, 1969; M.D., University of California, 1973. (See Department of Surgery.)

Judy M. Destouet, B.S., University of Southwestern Louisiana, 1969; M.D., Baylor College of Medicine, 1975.

John O. Eichling (Radiation Sciences), B.S., Northeastern Oklahoma State College, 1958; M.S., Oklahoma State College University, 1959; Ph.D., Washington University, 1970. (Also School of Dental Medicine.)

Harvey S. Glazer, B.A., Washington University, 1971; M.D., 1976.

John K. Gohagan, B.A., LaSalle College, 1964; M.A., Temple University, 1968; Ph.D., Massachusetts Institute of Technology, 1973. (Also School of Engineering and Applied Science.)

Rexford L. Hill (Computer Sciences), B.S., University of Cincinnati, 1964; M.S., 1966. (See Institute for Biomedical Computing.) (Also School of Engineering and Applied Science, Department of Computer Science.)

Robert G. Levitt, B.A., University of California, 1968; M.D., 1972.

Robert C. McKnight, B.S., Florida State University, 1957; M.D., Washington University, 1961. (See Department of Medicine.)

Tom R. Miller, B.S., California Institute of Technology, 1966; M.S., Stanford University, 1969; Ph.D., 1971; M.D., University of Missouri, 1976.

Gilbert H. Nussbaum (Radiation Physics), B.S., City College of New York, 1960; M.A., Harvard University, 1962; Ph.D., 1967.

Miljenko V. Pilepich, M.D., University of Zagreb, 1965.

Joseph L. Roti Roti (Cancer Biology), B.S., Michigan Technological University, 1965; Ph.D., University of Rochester, 1972.

Henry D. Royal, B.S., Providence College, 1970; M.D., St. Louis University, 1974.

Klaus Sartor, B.S., University of Tübingen, 1962; M.D., University of Düsseldorf, 1965.

Marilyn J. Siegel, A.B., Washington University, 1965; M.D., State University of New York, 1969. (See Department of Pediatrics.)

Joseph R. Simpson, A.B., Cornell University, 1963; Ph.D., University of Chicago, 1967; M.D., Harvard University, 1973.

Larry D. Simpson (Radiation Physics), A.B., University of Kansas, 1966; M.S., 1969; Ph.D., 1971.

Patrick R. M. Thomas, B.S., London University, 1965; M.B., 1968.

William G. Totty, B.A., David Lipscomb College, 1969; M.D., University of Tennessee, 1975.

Michael W. Vannier, B.S., Colorado State University, 1971; B.S.M.E., University of Kentucky, 1971; M.D., 1976. (See Department of Surgery, Division of Plastic and Reconstructive Surgery.)

Philip J. Weyman, B.A., Yale University, 1968; M.D., 1972.

Associate Professor Emeritus (Clinical)

A. Norman Arneson, B.S., Texas Christian University, 1924; M.D., Washington University, 1928. (See Department of Obstetrics and Gynecology.)

Associate Professors (Clinical)

Sumner Holtz, M.D., St. Louis University, 1948.

Christopher J. Moran, B.S., University of Notre Dame, 1970; M.D., St. Louis University, 1974.

Noah Susman, A.B., Washington University, 1948; M.D., 1952. (Jewish Hospital.)

Bruce J. Walz, A.B., Washington University, 1962; M.D., 1966.

Assistant Professors

Venkata R. Devineni, M.D., Osmania Medical College, 1974.

Armand Diaz (Technical Administration), R.N., R.T., Havana University School of Medicine, 1948.

Robert E. Drzymala (Radiation Physics), B.S., Northern Illinois University, 1972; Ph.D., University of Oklahoma, 1977.

Joseph N. Fields III, B.S., Massachusetts Institute of Technology, 1971; Ph.D., Stanford University, 1977; M.D., University of Miami, 1982.

Delia M. Garcia, B.S., Western Illinois University, 1976; M.D., Southern Illinois University, 1979.

Edward M. Geltman, B.S., Massachusetts Institute of Technology, 1967; M.D., New York University, 1971. (See Department of Medicine.)

Perry W. Grigsby, B.S., University of Kentucky, 1974; M.S., 1978; M.D., 1982.

Fernando R. Gutierrez, M.D., University of Valladolid, 1974.

David C. Hardy, M.D., University of Utah, 1977.

Jay P. Heiken, B.A., Williams College, 1974; M.D., Columbia University, 1978.

Donald V. Huebener (Dental Medicine), D.D.S., Washington University, 1969. (See Department of Pediatrics.) (Also School of Dental Medicine.)

Andrei Laszlo (Cancer Biology), B.S., University of Chicago, 1970; M.S., University of California, 1972; Ph.D., 1981.

Mark A. Mintun, B.S., Massachusetts Institute of Technology, 1977; M.D., Washington University, 1981.

Stephen M. Moerlein (Radiation Chemistry), B.S., University of Illinois, 1976; M.A., Washington University, 1978; Ph.D., 1982.

Barbara Monsees, B.A., Brandeis University, 1971; M.D., Washington University, 1975.

Robert J. Myerson, B.A., Princeton University, 1969; Ph.D., University of California, 1974; M.D., University of Miami, 1980.

Daniel D. Picus, B.S., University of Illinois, 1977; M.D., University of Chicago, 1981.

William J. Powers (Radiation Sciences), A.B., Dartmouth College, 1971; M.D., Cornell University, 1975. (See Department of Neurology and Neurological Surgery.)

Vythalingam Sathiseelan (Radiation Physics), B.Sc., Katubadde University, 1976; Ph.D., University of Bradford, 1982.

Emily L. Smith, A.B., Washington University, 1964; M.D., 1968.

Yvonne C. Taylor (Cancer Biology), B.A., Colgate University, 1975; M.Sc., University of Toronto, 1977; Ph.D., 1981.

Alan J. Tiefenbrunn, A.B., Washington University, 1970; M.D., 1974. (See Department of Medicine.)

Jerold W. Wallis, B.S., Yale University, 1976; M.S., Stanford University, 1981; M.D., 1981.

Anthony J. Wilson, M.B.Ch.B., Otago University, 1972.

John Wai-chiu Wong (Radiation Physics), B.A.Sc., University of Toronto, 1974; M.Sc., 1977; Ph.D., 1982.

John B. Zimmerman (Computer Sciences), B.A., University of Tennessee, 1975; M.S., University of North Carolina, 1977; M.S., University of Illinois, 1978; M.S., University of North Carolina, 1983; Ph.D., 1985. (Also School of Engineering and Applied Science, Department of Computer Science.)

Research Assistant Professors

Peter T. Fox (Radiation Sciences), B.A., St. John's College, 1975; M.D., Georgetown University, 1979. (See Department of Neurology and Neurological Surgery.)

Joel S. Perlmutter (Radiation Sciences), A.B., Princeton University, 1975; M.D., University of Missouri, 1979. (See Department of Neurology and Neurological Surgery.)

Kondapuram S. Sampathkumaran (Nuclear Medicine), B.S., Bangalore University, 1970; M.S., 1972; M.S., McMaster University, 1976.

Assistant Professor Emeritus (Clinical)

Wayne A. Simril, A.B., Culver-Stockton College, 1941; M.D., Washington University, 1944.

Assistant Professors (Clinical)

Robert J. Baglan, B.S., University of Kentucky, 1965; Ph.D., University of California, 1970; M.D., Washington University, 1976.

John L. Bardsley, B.A., University of Illinois, 1961; M.D., 1964.

Edward Cohen, A.B., Washington University, 1961; M.D., University of Missouri, 1969.

Enrique Cubillo, M.D., University of Madrid, 1962.

Gene L. Davis, Jr., B.A., University of Virginia, 1968; M.D., 1972.

James W. Debnam, Jr., B.A., University of Louisville, 1958; M.D., 1962.

Keith C. Fischer, A.B., Oberlin College, 1967; M.D., Johns Hopkins University, 1971.

Guillermo C. Geisse, B.A., University of Chile, 1957; M.D., 1965.

Albert E. Hesker, A.B., University of Missouri, 1961; M.D., 1964.

Daniel J. Leary, Jr., B.S., St. Louis University, 1962; M.D., Washington University, 1966.

Fransiska Lee, A.B., Washington University, 1962; M.D., 1966.

MacDonald B. Logie, B.S., Northwestern University, 1965; M.D., 1967.

Allan H. McCown, B.S., University of Idaho, 1962; M.D., Washington University, 1964.

Ben R. Mayes, Jr., B.A., Vanderbilt University, 1962; M.D., Washington University, 1966.

Gary H. Omell, M.D., University of Tennessee, 1967.

Arthur A. Porporis, A.B., Washington University, 1946; M.D., 1948.

Naris Rujanavech, M.D., Faculty of Medicine, Siriraj Hospital, 1972.

Robert F. Scheible, A.B., Johns Hopkins University, 1968; M.D., Washington University, 1972.

Chandrakant C. Tailor, M.B., B.S., Maharaja Sayajirao University of Baroda, 1972.

Instructors

Gail C. S. Anderson, B.A., Yale University, 1974; M.D., Tufts University, 1979.

Catherine H. Beal, B.A., St. Louis University, 1978; M.D., 1982.

Karen L. Beetham (Cancer Biology), B.A., St. Olaf College, 1968; M.S., University of Iowa, 1971; Ph.D., 1974.

Seymour Fox (Computer Sciences), B. Comm., McGill University, 1971; M.S., University of Oregon, 1972; Ph.D., University of Oklahoma, 1977.

Charles F. Garvin, B.A., University of Missouri, 1980; M.D., 1982.

Russell L. Gerber (Radiation Physics), B.S., Southern Illinois University, 1974.

William B. Harms, Sr., (Radiation Physics), B.S., University of Missouri, 1979.

Ryuji Higashikubo (Cancer Biology), B.S., Rikkyo University, 1969; M.A., Bowling Green State University, 1972; Ph.D., 1978.

Robert R. Kuske, B.A., Swarthmore College, 1976; M.D., University of Cincinnati, 1980.

Leonid Leybovich (Radiation Physics), M.S.E.E., Washington University, 1985.

Mary V. Marx, B.A., College of Wooster, Ohio, 1978; M.D., Ohio State University, 1981.

Paul L. Molina, Jr., B.A., Johns Hopkins University, 1979; M.D., University of North Carolina School of Medicine, 1983.

Daniel F. Mullen (Computer Sciences), B.S., University of Missouri, 1972; M.S., 1983; D.D.S., 1977.

David N. Rabin, B.S., Loyola University of Chicago, 1978; M.D., University of Illinois, 1982.

Theresa A. Reiman, B.S., Duke University, 1978; M.D., 1983.

Allan J. Romano, B.S., University of Washington, 1979; M.D., 1983.

Elliot I. Shoemaker, B.A., Muhlenberg College, 1979; M.D., Temple University, 1983.

Eric D. Slessinger, (Radiation Physics), B.S., University of Connecticut, 1974; M.S., St. Louis University, 1986.

Clement C. Wen, B.Sc., McGill University, 1977; M.D., Albert Einstein College of Medicine, 1981.

Research Instructors

James W. Brodack (Radiation Sciences), B.S., Eastern Illinois University, 1979; Ph.D., Massachusetts Institute of Technology, 1983.

Fyllis L. Otsuka, B.S., Purdue University, 1974; Ph.D., University of California, 1980.

Instructors (Clinical)

Stephen F. Albert, A.B., Washington University, 1964; M.D., St. Louis University, 1968.

Arthur F. Bishop, B.A., Northwestern University, 1972; M.D., University of Illinois, 1977.

Albert M. Hammerman, A.B., Washington University, 1973; M.D., 1976.

James A. Junker, A.B., St. Louis University, 1975; M.D., 1979.

Lawrence M. Kotner, Jr., B.A., Washington University, 1965; M.D., 1968.

Edward F. Ragsdale, B.A., University of Arkansas, 1960; M.D., Washington University, 1964.

Gary A. Ratkin, B.A., Rice University, 1963; M.D., Washington University, 1967. (See Department of Medicine.)

Gerald L. Shaikun, B.S., University of Kentucky, 1960; M.D., University of Chicago, 1964.

Gene W. Spector, B.A., Amherst College, 1954; M.D., Yale University, 1959.

Franz J. Wippold II, B.A., Westminster College, 1973; M.D., St. Louis University, 1977.

Frederick R. Zivnuska, B.S., St. Procopius College, 1961; M.S., Marquette University, 1964; M.D., University of Wisconsin, 1970.

Research Associates

David C. Ficke, B.S.E.E., Southern Illinois University, 1974.

Charles F. Hildebolt, B.S., Ohio State University, 1966; D.D.S., 1970; A.M., Washington University, 1985; Ph.D., 1987.

Dah-Ren Hwang, Ph.D., State University of New York, 1982.

Balakrishna Lokeshwar, M.Sc., Birla Institute of Science and Technology, 1978; Ph.D., Indian Institute of Science, 1984.

Kenzo Ohtsuka, B.S., Osaka University, Japan, 1972; M.S., 1974; Ph.D., 1977.

Research Assistants

Carmen S. Dence, B.S., Universidad del Atlantico, 1967; M.S., Florida State University, 1972.

Kathryn A. Hackman, B.S., Northeast Missouri State University, 1985.

Gary R. Hoffman, B.A., University of Missouri, 1976.

Lixin Lang, B.Sc., University of Science and Technology, China, 1982; M.A., Shanghai Institute of Nuclear Research, 1986.

Carla J. Mathias, B.A., Depauw University, 1976.

Consultants

Jose Maria V. Sala, B.S., Universidad del Litoral, 1936; M.D., 1944.

Mildred Trotter (Anatomy), A.B., Mount Holyoke College, 1920; Sc.M., Washington University, 1921; Ph.D., 1924; Sc.D., (hon.), Western College, 1956; Sc.D., (hon.), Mount Holyoke College, 1960; Sc.D., (hon.), Washington University, 1980. (See Department of Anatomy and Neurobiology.)

MARY CULVER

DEPARTMENT OF

SURGERY



SURGERY

The Department of Surgery includes general surgery, plastic and reconstructive surgery, orthopedic surgery, urological surgery, cardiothoracic surgery, and pediatric surgery. The formal instruction begins in the second year with an introductory course designed to provide the student with an understanding of the clinical and research characteristics of general surgery and the surgical specialties.

In the third year, students are assigned clinical clerkships where they have an opportunity to participate in the care of surgical patients. The clerkship lasts for twelve weeks and is spent at a hospital in the Washington University Medical Center. Students attend daily patient rounds with the house staff and attending staff. Seminars and teaching conferences are scheduled on a regular basis.

In the fourth year, students may select a subinternship or an elective, most of which are for periods of six to eighteen weeks. During the subinternship or preceptorship, the student is assigned to a staff member for instruction in the diagnosis and management of surgical problems. Electives are available in pediatric surgery, thoracic and cardiovascular surgery, orthopedic surgery, urologic surgery, oncologic surgery, transplantation surgery, and emergency room surgery.

SECOND YEAR

Introduction to Surgery

This course consists of 6 two-hour lectures in general surgery, cardiothoracic surgery, plastic surgery, urologic surgery, orthopedic surgery, and pediatric surgery. The surgical faculty presents the lectures which are designed to familiarize the student with the clinical and investigative opportunities of the various surgical disciplines.

THIRD YEAR

Surgical Wards

The majority of this 12-week course is devoted to general surgery. Students are assigned to rotations at either Barnes Hospital or Jewish Hospital. Students are active participants in the care of assigned patients. Formal conferences consist of case presentations to the faculty, core lectures in surgical pathophysiology, ward rounds, and departmental and divisional rounds.

FOURTH YEAR

The fourth-year students are offered clinical rotations either as subinternships or electives.

Surgical Preceptorships and Subinternships

Each student is assigned to a senior general surgeon. The student sees patients in the clinic and takes case histories, performs physical examinations, and follows patients admitted to the hospital. *Dr. Wells*



Pediatric Surgery Elective

Emphasis is placed on the diagnosis and treatment of the surgical diseases which develop in the pediatric age group. There are frequent morning and evening rounds and participation in operative procedures. Diagnostic x-rays are reviewed on a daily basis, and the student is encouraged to attend the conferences given by the Division of Pediatric Surgery and the Department of Pediatrics. *Dr. Ternberg and Staff*

Cardiothoracic Surgery

The students participating in the clinical rotation on the cardiothoracic surgical service will be assigned duties comparable to those of an intern. They will share night call under supervision of the first- and second-year residents in rotation with the ward interns. They may select operative cases on which to scrub and are at liberty to spend time within the cardiac catheterization laboratory with members of the cardiopulmonary bypass team, or on any particular problem of acute pulmonary or hemodynamic nature in the Intensive Care Unit. *Dr. Cox and Staff*

Plastic and Reconstructive Surgery Elective

The clerkship on Plastic Surgery is available for 6-12 weeks. The rotation may be either spent in a clinical or laboratory setting. The clinical rotation provides for the student to spend one week with each attending surgeon. Each service provides a unique opportunity for patient care; Dr. Marsh—congenital anomalies, craniofacial and maxillofacial surgery; Dr. Weeks—hand surgery; Dr. Young—reconstructive plastic surgery and microsurgery; Ward-Resident Service—general plastic surgery; Dr. Logan—reconstructive plastic surgery; Dr. Clement—cosmetic and reconstructive plastic surgery, and Dr. Mustoe—head and neck tumors. There are five weekly conferences, including an x-ray conference.

The laboratory rotation must be arranged with Dr. Weeks prior to the rotation to choose a suitable project. Current research projects include studies of wound healing, limb transplantation, and computerized three-dimensional modeling.

Dr. Weeks and Staff

Orthopedic Surgery Elective

Clinical clerkship electives are available for six weeks, during which time the student attends conferences and outpatient clinics. Students become an active part of the orthopedic team at Barnes Hospital and may spend part of their time at the Shriner's Hospital for Crippled Children, the St. Louis Regional Medical Center or the Veterans Administration Hospital. The exact program will be worked out on an individual basis with Dr. Vilray Blair III, Course Director. *Dr. Manske and Staff*

Urology Elective

A six-week clinical clerkship is designed to provide the student with an understanding of the more common problems in clinical urology. The student is taught basic diagnostic procedures and participates in

the management of surgical and non-surgical urologic patients. The experience involves direct care of patients in the clinics, as well as the urologic admissions to the hospital. Daily morning and evening rounds of all patients on a particular service are conducted by the responsible resident. Two additional teaching rounds for the house staff and students are held weekly. In addition, the student attends daily x-ray conferences, the weekly staff conference, and the weekly research seminar. *Dr. Catalona and Staff*

Renal Transplantation Elective

This orientation course is designed to offer the student an overview of the entire field of organ transplantation. The student is an integral part of the transplantation team and assumes appropriate responsibilities under supervision. *Dr. Flye and Staff*



Faculty

Bixby Professor of Surgery; Chairman, Department of Surgery

Samuel A. Wells, Jr., M.D., Emory University, 1961.

DIVISION OF CARDIOTHORACIC SURGERY

Head of Division

James L. Cox, M.D., University of Tennessee, 1967.

John M. Shoenberg Professor of Cardiovascular Surgery

Nicholas T. Kouchoukos, M.D., Washington University, 1961. (Jewish Hospital.)

Professors

John P. Boineau, B.S., University of South Carolina, 1955; M.D., Duke University, 1959.

Clarence S. Weldon, A.B., University of Michigan, 1951; M.D., Johns Hopkins University, 1955. (See Department of Pediatrics.)

Professors (Clinical)

Thomas B. Ferguson, B.S., Duke University, 1947; M.D., 1947.

Charles L. Roper, A.B., University of Colorado; M.D., 1953.

Associate Professor

R. Morton Bolman, III, B.A., Williams College, 1969; M.D., St. Louis University, 1973.

Associate Professor (Clinical)

Martin Bergmann, A.B., Washington University, 1942; M.D., 1945. (Jewish Hospital.)

Assistant Professors

William G. Marshall, M.D., Johns Hopkins University, 1973. (Jewish Hospital.)

Thomas L. Spray, B.A., Haverford College, 1970; M.D., Duke University, 1973.

Research Assistant Professor

Richard B. Schuessler, B.S., University of Missouri, Rolla, 1972; Ph.D., Clemson University, 1977.

DIVISION OF GENERAL SURGERY

Head of Division

Charles B. Anderson, A.B., Johns Hopkins University, 1958; M.D., Yale University, 1962.

Harry Edison Professor of Surgery

Gordon W. Philpott, B.S., Yale University, 1957; M.D., Washington University, 1961. (Jewish Hospital.)

Professors

Walter F. Ballinger, M.D., University of Pennsylvania, 1948.

Harvey R. Butcher, Jr., A.B., Central College, 1941; M.D., Harvard University, 1944.

M. Wayne Flye, B.S., University of North Carolina, Chapel Hill, 1964; M.D., 1967; M.A., Duke University, 1972; Ph.D., 1980. (See Department of Microbiology and Immunology.)

William W. Monafo, Jr., A.B., Harvard University, 1953; M.D., Tufts University, 1957.

Professors Emeriti

Eugene M. Bricker, M.D., Washington University, 1934.

J.G. Probststein, M.D., Loyola University, 1917.

Associate Professors

James M. Becker, B.A., Yale University, 1971; M.D., Case Western Reserve University, 1975.

John D. Halverson, B.A., Hamilton College, 1963; M.D., State University of New York, 1967.

Ira J. Kodner, A.B., Washington University, 1963; M.D., 1967. (Jewish Hospital.)

David W. Scharp, M.D., Washington University, 1970.

Gregorio A. Sicard, B.S., St. Louis University, 1965; M.D., University of Puerto Rico, 1972.

Associate Professors (Clinical)

Richard V. Bradley, M.D., Washington University, 1952.

Ralph J. Graff, A.B., Washington University, 1957; M.D., 1957. (See Department of Genetics.)

Robert H. Lund, B.S., Miami University, 1945; M.D., Washington University, 1949.

Leo A. Sachar, A.B., Washington University, 1936; M.D., 1940. (Jewish Hospital.)

William D. Shieber, M.D., Washington University, 1953. (Jewish Hospital.)

Richard G. Sisson, A.B., Harvard University, 1943; M.D., Yale University, 1946. (Jewish Hospital.)

George L. Tucker, A.B., Columbia University, 1952; M.D., Harvard University, 1956.

Willard B. Walker, M.D., Washington University, 1946.

Assistant Professors

Brent T. Allen, B.S., Utah State University, 1975; M.D., Washington University School of Medicine, 1979.

Robert D. Fry, A.B., Oklahoma City University, 1968; M.D., Washington University, 1972. (Jewish Hospital.)

Douglas W. Hanto, B.A., St. Olaf College, 1973; M.D., University of Arizona, 1977.

Associate Professor Emeritus

C. Alan McAfee, B.S., Washington State College, 1938; M.D., Washington University, 1942.

Research Associate Professor

William G. Dilley, B.A., University of California, 1965; M.A., 1967; Ph.D., 1970.

Assistant Professors (Clinical)

Kenneth J. Arnold, B.A., Notre Dame University, 1964; M.D., Washington University, 1968.

Kenneth J. Bennett, M.D., Tulane University, 1965. (Jewish Hospital.)

Robert C. Donaldson, A.B., University of Missouri, 1941; M.D., Washington University, 1944. (St. Louis VA. Hospitals.)

Richard H. Fallon, B.S., Boston College, 1952; M.D., Harvard University, 1956; A.M., Washington University, 1971.

Alvin Goldfarb, A.B., Washington University, 1940; M.D., 1943. (Jewish Hospital.)

Fleming B. Harper, M.D., Medical College of Virginia, 1947.

Jerome F. Levy, A.B., Washington University, 1954; M.D., 1958.

Stanley L. London, M.D., Washington University, 1949. (Jewish Hospital.)

Sherwin H. Malt, A.B., Washington University, 1962; M.D., University of Missouri, 1966. (Jewish Hospital.)

Jerry R. Meyers, B.A., University of Texas, 1962; M.D., Washington University, 1966.

Shale M. Rifkin, M.D., Washington University, 1948. (Jewish Hospital.)

Andrew D. Spencer, A.B., Indiana University, 1951; M.D., 1954.

Research Assistant Professor

Harry W. Margraf, Ph.D., Polytechnic Milan, 1943; Sc.D., Washington University, 1971. (Jewish Hospital.)

Instructors

Dorothy P. Andriole, B.A., New York University, 1976; M.D., 1980.

L. Michael Brunt, B.A., University of Mississippi, 1976; M.D., Johns Hopkins University School of Medicine, 1980.

Martin D. Jendrisak, B.S., University of Akron, 1975; M.D., Ohio State University, 1978.

Leonardo I. Valentin, B.S., University of Puerto Rico, 1977; M.D., 1981.

Instructors (Clinical)

John B. Buettner, A.B., Dartmouth College, 1963; M.D., Washington University, 1967.

Arthur R. Dalton, B.S., University of Missouri, 1939; B.S. Med., Northwestern University, 1940; M.D., 1941.

Ronald J. Gaskin, A.B., Washington University, 1966; M.D., 1970.

Jay W. Haines, B.A., Trinity University, 1970; M.D., Chicago Medical School, 1974.

John D. Hirsch, B.A., Case Western Reserve University, 1969; M.D., Washington University, 1973. (Jewish Hospital.)

Robert J. Kingsbury, A.B., Asbury College, 1956; M.D., University of Michigan, 1960.

David P. Krajcovic, A.B., Washington University, 1965; M.D., 1969.

G. Lynn Krause, Jr., A.B., Amherst College, 1950; M.D., University of Pennsylvania, 1954.

Alan M. Londe, A.B., Washington University, 1957; M.D., 1961.

Julian C. Mosley, Jr., B.S., St. Louis University, 1966; M.D., Washington University, 1972.

George A. Oliver, A.B., Washington University, 1948; M.D., 1952.

Charles L. Parks, B.A., University of North Dakota, 1967; M.D., Washington University, 1969.

Joseph C. Peden, Jr., B.S., Harvard University, 1940; M.D., 1943.

Mather Pfeifferberger, Jr., A.B., Yale University, 1941; M.D., Harvard University, 1944.

Frank O. Richards, A.B., Talladega College, 1944; M.D., Howard University, 1947. (Jewish Hospital.)

Donald C. Sauer, A.B., Washington University, 1956; M.D., 1960. (Jewish Hospital.)

Belmont R. Thiele, M.D., St. Louis University, 1948.

Instructors Emeriti

Virgil O. Fish, M.D., Washington University, 1930.

George C. Wee, M.D., University of Louisville, 1931.

Research Instructor

Judith M. Connett, B.A., University of Chicago, 1968; Ph.D., Washington University, 1979. (Jewish Hospital.)

Assistants (Clinical)

Arthur I. Auer, B.S., Massachusetts Institute of Technology, 1952; M.D., Washington University, 1956.

Leslie F. Bond, A.B., University of Illinois, 1948; M.D., Meharry Medical College, 1952.

Katherine Crawford, B.S., Michigan State College, 1943; M.D., Woman's Medical College of Pennsylvania, 1946.

James R. Criscione, B.S., Youngstown University, 1943; M.D., St. Louis University, 1951.

Samuel Lugo, B.S., St. Louis University, 1954; M.D., 1958.

Lester J. Nathan, B.A., University of Omaha, 1949; M.D., University of Nebraska, 1952.

Robert Rainey, B.S., Yale University, 1944; M.D., Washington University, 1947.

DIVISION OF ORAL AND MAXILLOFACIAL SURGERY

Acting Head of Division

Allen Sclaroff, B.A., University of Colorado, 1968; D.D.S., Temple Health Science Center, 1972.

Professor

Louis Altshuler, D.D.S., Ohio State University, 1945.

Assistant Professors

Marc B. Abrams, B.S., University of Missouri, 1968; D.D.S., 1972.

Herman Turner, D.D.S., St. Louis University, 1946; M.S., Georgetown University, 1951.

Lecturer

Leroy W. Peterson, D.D.S., University of Michigan, 1940.

DIVISION OF ORTHOPEDIC SURGERY

Fred C. Reynolds Professor and Head of Division

Paul R. Manske, B.A., Valparaiso University, 1960; M.D., Washington University, 1964; (See Irene Walter Johnson Institute of Rehabilitation.)

Professor

Lee T. Ford, M.D., University of Tennessee, 1940.

Associate Professor

Perry L. Schoenecker, B.S., University of Wisconsin, 1964; M.D., 1968.

Associate Professors (Clinical)

Marshall B. Conrad, A.B., Westminster College, 1942; M.D., Washington University, 1945.

Harry C. Morgan, B.A., University of Missouri, 1949; B.S., 1951; M.D., Harvard University, 1953.

Assistant Professors

Vilray P. Blair III, B.A., Harvard University, 1973; M.D., Duke University, 1977.

Keith H. Bridwell, A.B., Washington University, 1973; M.D., 1977.

Lawrence A. Kriegshauser, B.S., Regis College, 1974; M.D., University of Missouri, 1978.

Clayton R. Perry, B.A., Swarthmore College, 1973; M.D., St. Louis University, 1977.

Margaret M. Rich, B.S., Northwestern University, 1972; M.D., 1976; Ph.D., 1977.

Robert A. Shively, B.S., University of Illinois, 1965; M.D., 1969.

William B. Strecker, B.A., University of Missouri, 1971; M.D., St. Louis University, 1975.

Assistant Professors (Clinical)

James C. Ellsasser, B.S., Duke University, 1960; M.D., Washington University, 1964.

Jerome J. Gilden, A.B., Washington University, 1948; M.D., 1952. (Jewish Hospital.)

Jordon H. Ginsburg, B.A., University of Michigan, 1968; M.D., University of Illinois, 1972. (Jewish Hospital.)

Robert E. Kuhlman, A.B., Washington University, 1953; M.D., 1956.

Marvin R. Mishkin, B.A., Roosevelt College, 1950; M.D., University of Illinois, 1955. (Jewish Hospital.)

George E. Scheer, B.A., Municipal University of Wichita, 1940; M.D., Washington University, 1943.

Assistant Professor Emeritus

J. Otto Lottes, Ph.B., St. Louis College of Pharmacy, 1926; Ph.G., 1928; A.B., University of Missouri, 1934; B.S., 1935; M.D., University of Louisville, 1937.

Research Assistant Professors

Jean E. Childers, B.A., Cornell University, 1965; Ph.D., Rice University, 1970.

Leo A. Whiteside, B.S., University of Oklahoma, 1965; M.D., University of Texas Southwestern Medical School, 1969.

Instructors (Clinical)

Donald R. Bassman, A.B., Washington University, 1971; M.D., 1975. (Jewish Hospital.)

Vilray P. Blair, Jr., B.A., University of Virginia, 1935; M.D., Washington University, 1939.

Donald H. Brancato, B.A., Northwestern University, 1963; M.D., 1967.

William S. Costen, A.B., Princeton University, 1950; M.D., Washington University, 1954.

Ronald C. Hertel, A.B., Washington University, 1952; M.D., 1956.

Barrett K. Holder, B.A., Southern Illinois University, 1965; M.D., Washington University, 1969.

Robert C. Lander, B.A., University of Michigan, 1968; M.D., University of Illinois, 1972.

W. Edward Lansche, A.B., Washington University, 1948; M.D., 1952.

Charles I. Mannis, A.B., Washington University, 1965; M.D., University of Missouri, Columbia, 1969. (Jewish Hospital.)

Alan H. Morris, B.A., University of Illinois, 1959; M.D., 1963. (Jewish Hospital.)

Margaret M. Oakley, B.S., University of Illinois, 1955; M.D., St. Louis University, 1959. (Shriners Hospital for Crippled Children.)

Robert L. Pierron, M.D., University of Missouri, 1975. (Shriners Hospital for Crippled Children.)

Barry L. Samson, B.A., University of Wisconsin, 1970; M.D., Washington University, 1974. (Jewish Hospital.)

John J. Sheridan, B.A., University of Notre Dame, 1965; M.D., Washington University, 1969. (Shriners Hospital for Crippled Children.)

Keith R. Swanson, B.S., Midwestern University, 1967; M.D., University of Texas, Galveston, 1971. (Shriners Hospital for Crippled Children.)

Michael H. Winer, A.B., Washington University, 1964; M.D., University of Illinois, 1968. (Jewish Hospital.)

Research Instructor

S. Vic Glogovac, A.B., Washington University, 1969; M.D., 1973.

Assistants (Clinical)

John P. Arnot, B.A., Rice University, 1954; M.D., Yale University, 1958.

Kyu Sop Cho, M.D., Yon-Sei University, 1954.

Herman E. Russell, B.A., New York University, 1950; M.D., University of Geneva, 1956.

George R. Schoedinger III, M.D., University of Oregon, 1962.

DIVISION OF PEDIATRIC SURGERY

Head of Division

Jessie L. Ternberg, A.B., Grinnell College, 1946; Ph.D., University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Pediatrics.)

Associate Professor

Richard J. Bower, B.S., Northern Illinois University, 1965; M.D., University of Virginia, 1969. (See Department of Pediatrics.)

DIVISION OF PLASTIC AND RECONSTRUCTIVE SURGERY

Head of Division

Paul M. Weeks, A.B., Duke University, 1954; M.D., University of North Carolina, 1958. (See Irene Walter Johnson Institute of Rehabilitation.)

Professor

Jeffrey L. Marsh, B.A., Johns Hopkins University, 1967; M.D., 1970. (See Department of Pediatrics.)

Professor Emeritus

Minot P. Fryer, A.B., Brown University, 1936; M.D., Johns Hopkins University, 1940; D.S.C., Brown University, 1972.

Associate Professor

V. Leroy Young, B.A., University of Kentucky, 1966; M.D., 1970.

Assistant Professors

Richard W. Clement, B.S., Alma College, 1974; M.D., University of Virginia, 1979.

Samuel E. Logan, B.S., California Institute of Technology, 1968; M.S., Ph.D., 1972; M.D., University of California—Los Angeles, 1976.

Thomas A. Mustoe, B.A., Harvard College, 1973; M.D., Harvard Medical School, 1978.

Kathryn C. Stallcup, B.S., University of Oklahoma, 1974; Ph.D., Harvard University, 1980.

Michael W. Vannier, B.S., Colorado State University, 1971; B.S.M.E., University of Kentucky, 1971; M.D., 1976. (See Department of Radiology.)

Assistant Professors (Clinical)

Joseph W. Eades, A.B., Amherst College, 1952; M.D., Washington University, 1960. (Jewish Hospital.)

George H. Zografakis, M.S., Rutgers University, 1955; M.D., State University of New York, Upstate, 1959.

Instructors (Clinical)

David A. Caplin, A.B., Kenyon College, 1971; M.D., University of Cincinnati, 1975. (Jewish Hospital.)

Bruce I. White, M.D., Washington University, 1964. (Jewish Hospital.)

DIVISION OF UROLOGIC SURGERY

Head of Division

William J. Catalona, B.S., Otterbein College, 1964; M.D., Yale University, 1968.

Professors

Saul Boyarsky, B.S., University of Vermont, 1943; M.D., 1946.

Charles B. Manley, Jr., A.B., University of Missouri, 1955; M.D., 1958. (See Department of Pediatrics.)

Professors (Clinical)

Morris Abrams, B.S., University of Illinois, 1934; M.D., 1937. (Jewish Hospital.)

Robert K. Royce, B.S., University of Mississippi, 1939; M.D., Washington University, 1942.

Associate Professor

Ralph V. Clayman, B.A., Grinnell College, 1969; M.D., University of California, San Diego, 1973. (See Department of Radiology.)

Associate Professors (Clinical)

William T. Bowles, A.B., Stanford University, 1952; M.D., 1955.

M. Richard Carlin, B.A., Dartmouth College, 1944; M.D., Yale University, 1947.

Research Associate Professor

Timothy L. Ratliff, B.S., University of Texas, 1971; M.S., East Texas University, 1974; Ph.D., University of Arkansas, 1977. (Jewish Hospital.)

Assistant Professors

Gerald L. Andriole, B.S., Pennsylvania State University, 1976; M.D., Jefferson Medical College, 1978.

Robert R. Bahnson, A.B., Carleton College, 1975; B.S., University of South Dakota, 1977; M.D., Tufts University, 1979.

Herbert Lepor, B.A., University of California-Los Angeles, 1975; M.D., Johns Hopkins University School of Medicine, 1979.

Ellen Shapiro, B.S., University of Nebraska, 1975; M.D., 1978.

***Assistant Professors
(Clinical)***

Lawrence M. Aronberg, A.B., Washington University, 1932; M.D., 1936. (Jewish Hospital.)

James G. Bucy, B.S., Haverford College, 1958; M.D., Northwestern University, 1962.

Richard P. Parsons, B.D., Missouri Valley College, 1954; M.D., Washington University, 1958.

Instructors (Clinical)

Saul Klein, M.D., Syracuse University, 1959. (Jewish Hospital.)

Thomas Lyles, B.A., Southern Illinois University, 1969; M.D., Washington University, 1975. (Jewish Hospital.)

Neal Neuman, M.D., St. Louis University, 1971. (Jewish Hospital.)

Herbert Sunshine, A.B., Washington University, 1950; M.D., 1954. (Jewish Hospital.)

***Research Assistant
Professor***

Franz U. Steinberg, M.D., University of Berne, 1938. (See Department of Medicine.)

Research Associate

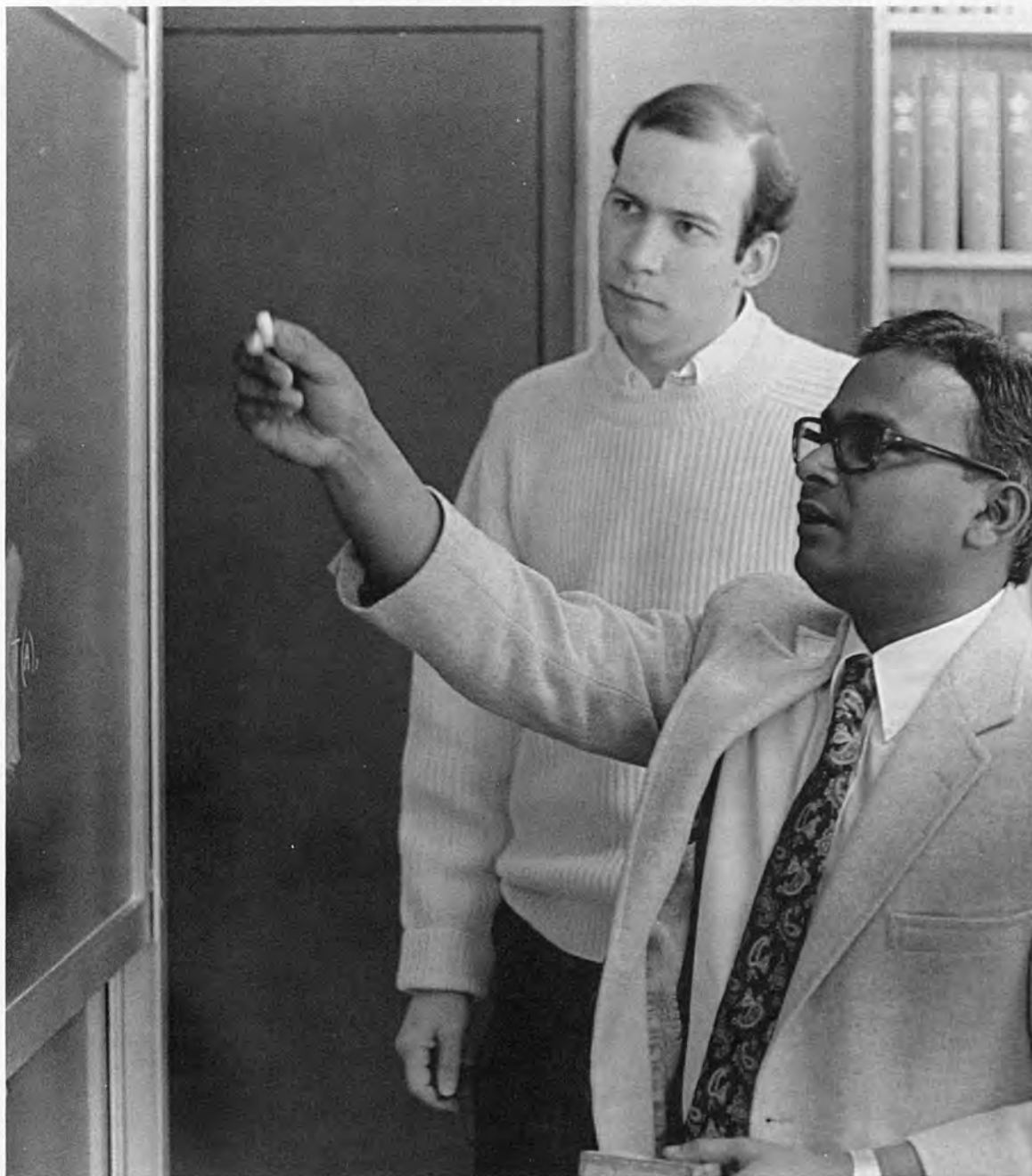
Rose Boyarsky, B.S., University of Vermont, 1944; M.A., Columbia University, 1946; Ph.D., Duke University, 1969.

TEACHING AND RESEARCH DIVISIONS

DIVISION OF BIOSTATISTICS

The Division of Biostatistics is a medical school-wide facility that engages in teaching, research, and biostatistical consultation activities. A course given in the first trimester of the first year, Introduction to Biostatistics, affords a basis for understanding quantitative assessment in biology and medicine, and prepares the

student for critical evaluation of reports in the medical literature. Interested students may pursue more intensive studies through electives offered by the Division. At the initiative of other departments, the Division also offers additional short courses in biostatistics. The Division participates actively in both pre- and post-doctoral training. In addition to the core research program of the Division, its research activities include collaborative projects with various departments of the School. Biostatistical consultation represents a major activity of the Division, providing expertise in both theoretical and applied areas.



FIRST YEAR

Introduction to Biostatistics

This introduction to the principles and methods of biostatistics emphasizes the concepts of statistical methodology and the appropriate design of clinical research projects as being essential to the proper application and interpretation of statistical methods and to a critical evaluation of the medical literature. Elementary statistical techniques illustrating the use of statistical principles in experimental and clinical research are discussed. Clinical summaries often precede the biostatistical lectures, highlighting the relevance of certain statistical principles. Small group discussions are also organized on prechosen topics to better prepare the students in evaluating published medical reports. Drs. Schechtman and Spitznagel

ELECTIVES

Applied Biostatistics: A Seminar Elective

This elective is intended for students who have completed a basic biostatistics course and who want to increase their understanding of contemporary statistical techniques, particularly those commonly applied in clinical research. Students are expected to participate in the analysis and critique of studies appearing in the medical literature. The emphasis is on the appropriateness of the statistical techniques and underlying rationale rather than on mathematical details of the techniques. Both basic (e.g., t tests, chi-squared tests, correlation, regression) and more advanced multivariate techniques (e.g., multiple regression, discriminant analysis, analysis of variance) are covered during the seminar. Pre- and post-doctoral students in Biostatistics are required to take this course. Mr. Miller and Staff

Genetic Epidemiology: A Research Elective

After being introduced to current approaches in Genetic Epidemiology, interested students are supervised on research projects dealing with methodological developments as well as analysis of real data. Topics to be covered include: resolution of cultural and biological inheritance, with emphasis on multivariate associations and temporal trends; detection of major gene effects, with emphasis on pleiotropy and genetic heterogeneity; and linkage analysis and gene mapping. Pre- and post-doctoral students in genetic epidemiology are required to take this course. Dr. Rao and Staff

RESEARCH

Research activities of the Division span a wide range of topics dealing with a number of disorders of considerable public health importance, providing research opportunities at both theoretical and applied levels. Several research projects involve close interaction and collaboration with a number of research groups at the Medical Center. The present core research program of the Division deals with genetic epidemiology, especially as it relates to cardiovascular disease. A number of theoretical and applied problems are addressed, including: nature-nurture resolution and identification of the genetic basis of risk factors such as lipids, lipoproteins, apolipoproteins, obesity, blood pressure, and glucose tolerance; exploration of temporal trends in the degree of genetic and environmental effects; and multivariate associations among multiple risk factors. Timely theoretical issues are also addressed, such as the sampling of families through patients, and statistical properties of methods of data analysis. Present collaborative research projects include: a coordinating center for drug trials in neuromuscular diseases, especially Duchenne Dystrophy; studies in psychiatric epidemiology; studies of the epidemiology of falls, hip fracture, and osteoporosis; Centers for the study of diabetes and Alzheimer's disease; a SCOR project involving several laboratory and clinical research protocols on ischemic heart disease; three epidemiological research projects developing methods for increasing public awareness and utilization of measures which are known to decrease the likelihood of developing heart disease, and for encouraging behaviors which will improve prognosis following a heart attack; and epidemiological genetics and family studies of mental disorders, including schizophrenia and alcoholism.

BIostatistical CONSULTATION

The Division provides consultation in a wide range of areas including the statistical design of experiments and clinical trials, protocol development, data base management, analysis of data, and interpretation of results. Some of the areas of special strength and expertise include cardiovascular biostatistics, computing, and statistical packages. The Division is well equipped to provide assistance at the stage of preparing grant applications, including careful discussions of study design, sample size calculations, randomization schemes, computer resources, and data analysis.

Faculty

Professor and Director

Dabeeru C. Rao, B.S., Indian Statistical Institute, 1967; M.S., 1968; Ph.D., 1971. (See Departments of Psychiatry and Genetics.)

Professors

Stanley Sawyer, B.S., California Institute of Technology, 1960; Ph.D., 1964. (Also Faculty of Arts and Sciences.)

Edward L. Spitznagel, Jr., B.S., Xavier University, 1962; M.S., University of Chicago, 1963; Ph.D., 1965. (Also Faculty of Arts and Sciences.)

Reimut Wette, B.S., University of Heidelberg, 1949; M.S., 1952; D.Sc., 1955.

Associate Professors

J. Philip Miller, A.B., Washington University, 1965.

John P. Rice, B.A., Cornell University, 1969; M.A., Washington University, 1972; Ph.D., 1975. (See Department of Psychiatry.)

Assistant Professor

Emeritus

Barbara B. Hixon, B.S., University of Illinois, 1941.

Assistant Professors

Mae O. Gordon, B.A., Portland State University, 1967; M.S., University of Wisconsin, 1970; Ph.D., 1978. (See Department of Ophthalmology.)

Curtis A. Parvin, B.S., Michigan State University, 1974; M.S., University of Minnesota, 1976; Ph.D., 1980. (See Departments of Pathology and Medicine.)

Kenneth B. Schechtman, B.S., City College of New York, 1967; M.S., Purdue University, 1971; M.A., Washington University, 1978; Ph.D., 1978. (See Department of Medicine.)

George P. Vogler, B.A., Rutgers, 1978; M.A., University of Colorado-Boulder, 1982; Ph.D., 1985.

Research Assistant Professor

Ingrid B. Borecki, B.S., University of Illinois, 1977; M.S., University of Hawaii, 1980; Ph.D., 1981.

Instructor

Michael A. Province, B.A., University of Dallas, 1973; A.M., Washington University, 1979; Ph.D., 1987.

Research Instructor

Treva K. Rice, B.S., University of Texas-Arlington, 1981; M.A., University of Colorado-Boulder, 1984; Ph.D., 1987.

INSTITUTE FOR BIOMEDICAL COMPUTING

The Institute for Biomedical Computing is an inter-school facility which spans computing research activities at both the School of Medicine and the School of Engineering and Applied Science. The Institute consists of two research-laboratory components, the Biomedical Computer Laboratory (BCL) and the Computer Systems Laboratory (CSL), both of which have close ties with the departments of Computer Science and Electrical Engineering as well as with most departments in the School of Medicine.

The BCL emphasizes the development of specialized computer systems for use in the solution of research problems in biomedicine. Several systems now in clinical use have seen a progression from exploratory pilot studies, through major development projects, to public availability through commercial manufacture. In general, BCL focuses on applications which require strong coupling of the computer to its environment for digital signal processing and quantitative biomedical imaging. Such applications employ computers and microprocessors in conjunction with specialized hardware designed and built locally. Many applications have been addressed by bringing signals from hospital wards and research laboratories to BCL or more frequently by taking the computers to investigators' laboratories or patients' bedsides.

The central theme of CSL's program has been the development of tools for building specialized computer systems for challenging applications, and the construction of high-performance systems using these tools. The emergence of design and fabrication technologies for Very-Large-Scale Integrated (VLSI) circuits over the last several years has been a major stimulus to the CSL program. Current research is focused on the development of theory and derivative computer-aided design tools for the specification and construction of highly parallel computer systems. This work draws on long experience in the design of asynchronous circuits and systems.

The purpose of the Institute for Biomedical Computing is to foster the development and application of advanced computing and engineering technologies to problems in biomedical science. In addition to its activities in collaborative research, the Institute serves as a focal point for interdisciplinary teaching and student research in areas not ordinarily included in conventional curricula.

BMed 582. Biophysical Measurements (Same as EE 582)

Specific variables measured in life-science research and in clinical medicine such as force, displacement, pressure, biopotentials, ion and gas concentration, flows, etc., are examined and techniques for converting them to electrical signals are discussed. Prerequisites: EE 482 or equivalent, elementary electromagnetic theory. Credit 3 units. *Prof. Shipton*

BMed 693. Physical and Mathematical Principles of Tracer Kinetics

Topics in the theoretical foundations of tracer-kinetic methods include differential equations for conservation of tracer mass, applications of elementary linear systems theory, stochastic and compartmental models, methods of accounting for tracer recirculation, and methods of data processing. *Dr. Larson*

Research Opportunities

Research activities of the Institute for Biomedical Computing span a wide range from basic biological science and clinical research to topics in biomedical engineering, signal processing, computer architectures, and integrated circuit design. Many research projects of the Institute involve collaboration with researchers in the basic sciences and clinical departments of the School of Medicine, or in the Departments of Computer Science and Electrical Engineering of the School of Engineering and Applied Science. Additional collaborations take place through the interdepartmental program in Biomedical Engineering.

Current emphasis in the core research program of the Biomedical Computer Laboratory is on quantitative biomedical imaging, which includes: modeling of biological phenomena as image sources; transduction processes; instrumentation characteristics; data analysis strategies for extraction of information from im-

ages; algorithms for image construction and analysis; tissue characterization via quantitative ultrasonic imaging; and development of a distributed facility for image presentation, analysis, and quantification.

Present collaborative projects in BCL include research in: 1) the pathogenesis, treatment, and sequelae of ischemic heart disease; 2) the development of methods for precise, three-dimensional dose computations in radiation treatment planning; 3) the noninvasive delineation of pharmacology, blood flow, and metabolism in the brain; 4) the improvement of analysis methods for neuroanatomical imaging; 5) the development of advanced picture archive and communication systems for electronic radiology; 6) the improvement of positron-emission tomography systems employing photon time-of-flight information; 7) the development of a global method for physical mapping of DNA; and 8) the pathophysiology of glaucoma employing retinal imaging for regional blood-flow estimation.

The core research project of the Computer Systems Laboratory is development of techniques for designing very-large-scale integrated computer systems (VLSI) specialized for biomedical applications requiring unusual computing capability. Collaborative application projects include support of BCL projects as well as other collaborations in the areas of drug design, molecular graphics and modeling, auditory, physiology, and information-systems research.

Drs. Molnar and Thomas





Faculty

Professor and Director, and Director of CSL

Charles E. Molnar, B.S.E.E., Rutgers University, 1956; M.S.E.E., 1957; Sc.D., Massachusetts Institute of Technology, 1966. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science.)

Associate Professor and Associate Director, and Director of BCL

Lewis J. Thomas, Jr., B.S., Haverford College, 1953; M.D., Washington University, 1957. (See Departments of Anesthesiology and Cell Biology and Physiology.) (Also School of Engineering and Applied Science.)

Associate Professor and Associate Director of BCL

G. James Blaine III, B.S., Washington University, 1959; M.S., 1961; D.Sc., 1974. (Also School of Engineering and Applied Science.)

Associate Professor and Associate Director of CSL

Frederick U. Rosenberger, B.S., Washington University, 1961; M.S., New York University, 1963; D.Sc., 1969. (Also School of Engineering and Applied Science.)

Assistant Director of BCL

Russell E. Hermes, B.S., Southern Illinois University, 1977; M.S., Washington University, 1982. (Also School of Engineering and Applied Science.)

Assistant Director of CSL

Gerald C. Johns, B.S., Washington University, 1966.

Professors

R. Martin Arthur, B.A., Rice University, 1962; B.S., 1963; M.S., 1964; Ph.D., University of Pennsylvania, 1968. (Also School of Engineering and Applied Science.)

Jerome R. Cox, Jr., S.B., Massachusetts Institute of Technology, 1947; S.M., 1949; Sc.D., 1954. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science.)

James G. Miller, A.B., St. Louis University, 1964; M.A., Washington University, 1966; Ph.D., 1969. (See Department of Medicine.) (Also Faculty of Arts and Sciences.)

Harold W. Shipton, C.Eng., Shrewsbury Technical College, 1949. (Also School of Engineering and Applied Science.)

Donald L. Snyder, B.S., University of Southern California, 1961; M.S., Massachusetts Institute of Technology, 1963; Ph.D., 1966. (Also School of Engineering and Applied Science.)

Research Professor

Kenneth B. Larson, Met.E., Colorado School of Mines, 1954; S.M., Massachusetts Institute of Technology, 1958; Ph.D., 1964. (See Department of Neurology and Neurological Surgery.)

Associate Professors

William M. Hart, Jr., Ph.D., University of Maryland, 1970; M.D., 1970. (See Department of Ophthalmology.)

Rexford L. Hill, B.S., University of Cincinnati, 1964; M.S., 1966. (See Department of Radiology.)

Michael I. Miller, B.S., State University of New York (Stony Brook), 1976; M.S., Johns Hopkins University, 1978; Ph.D., 1983. (Also School of Engineering and Applied Science.)

Research Associates

Thomas J. Chaney, B.S., Kansas State University, 1962; M.S., Washington University, 1969.

Kenneth W. Clark, B.S., St. Louis University, 1965; M.S., 1967.

A. Maynard Engebretson, B.S., University of Minnesota, 1958; M.S., Washington University, 1963; D.Sc., 1970. (Also Central Institute for the Deaf.)

Ting-P. Fang, B.S., National Taiwan University, 1967; M.S., Washington University, 1975; D.Sc., 1979.

John W. Matthews, B.S., Washington University, 1968; M.S., 1972; D.Sc., 1980.

Don A. Ronken, B.S., University of Washington, 1963; Ph.D., 1967.

John Wai-chiu Wong, B.S., University of Toronto, 1974; M.S., 1977; Ph.D., 1978. (See Department of Radiology.)

THE MEDICAL CARE GROUP OF ST. LOUIS (MCG)

MCG is a prepaid group practice providing comprehensive health services to more than 42,000 people in the St. Louis area. Since its beginning in 1969, MCG's relationship with the School of Medicine has been as a teaching and research unit serving as a model practice setting within a medical school environment. It is housed in a separate facility on the campus of the School of Medicine and also provides primary care services at four outlying facilities in St. Louis County.

STAFF

Gail A. Ahumada, A.B., Stanford University, 1961; M.A., 1962; M.D., University of California, San Diego, 1972. (See Department of Medicine.)

Patricia J. Amato, B.A., Notre Dame College of Ohio, 1979; M.D., Medical College of Ohio, 1982. (See Department of Pediatrics.)

Scott Anderson, B.A., University of California, San Diego, 1975; Ph.D., Duke University, 1981; M.D., 1982. (See Department of Medicine.)

Bonnie Aust, B.A., University of Texas, 1975; M.D., University of Texas Medical School at San Antonio, 1979. (See Department of Pediatrics.)

Jill Baer, B.S., University of Kentucky, 1972; M.D., 1975. (See Department of Pediatrics.)

Marion H. Baker, R.N., St. John's Hospital, 1946; P.N.P., Cardinal Glennon Memorial Hospital for Children, 1973. (See Department of Pediatrics.)

Miriam Behar, B.A., University of California-San Francisco, 1977; M.D., The Johns Hopkins School of Medicine, 1981. (See Department of Pediatrics.)

Carl Blatt, B.A., Vanderbilt University, 1976; M.D., Georgetown University, 1980. (See Department of Medicine.)

Joyce Boehmer, B.S., New College, 1975; M.D., University of Missouri, 1979. (See Department of Medicine.)

Eyla Boies, B.S., College of Idaho, 1974; M.D., Washington University School of Medicine, 1978. (See Department of Pediatrics.)

Kathleen Bruns, B.S., Western Michigan University, 1977; M.D., St. Louis University, 1981. (See Department of Medicine.)

Charles Butrick, B.S., Kansas State University, 1977; M.D., Kansas University Medical School, 1980. (See Department of Obstetrics and Gynecology.)

James Corry, B.A., Grinnell College, 1970; M.D., Washington University, 1974. (See Department of Pediatrics.)

John C. Davis, B.S., Michigan State University, 1976; M.D., University of Michigan, 1980. (See Department of Pediatrics.)

Irl J. Don, A.B., Washington University, 1968; M.D., 1972. (See Department of Medicine.)

Charles Dougherty, B.S., College of the Holy Cross, 1969; M.D., University of Rochester School of Medicine, 1973. (See Department of Pediatrics.)

Cathleen Faris, B.A., University of Kansas, 1977; M.D., 1982. (See Department of Obstetrics and Gynecology.)

Michael Fedak, B.A., Washington University, 1978; M.D., University of Missouri-Columbia, 1982. (See Department of Medicine.)

Branka Ford, B.S., New York University, 1965; M.D., McMaster University, 1975. (See Department of Medicine.)

Kathy Garcia, B.S., University of California, 1976; M.D., Harvard Medical School, 1980. (See Department of Medicine.)

Inpatient care occurs in the hospitals of the Washington University Medical Center. The practice is a site for optional programs for advanced residents in general internal medicine and general pediatrics. An elective is available for senior medical students.

MCG is also a source of data for various clinical and health services research.

The practice is staffed by physicians who are members of the faculty of the School of Medicine in the departments of Internal Medicine, Pediatrics, Preventive Medicine, and Obstetrics and Gynecology.

Joseph Gibbons, B.S., Georgetown University, 1977; M.D., Ohio State University College of Medicine, 1980. (See Department of Pediatrics.)

Nancy Z. Guggenheim, B.C., Brown University, 1976; M.D., 1980. (See Department of Medicine.)

Will Holcomb, B.A., Purdue University, 1970; M.D., Indiana University, 1974. (See Department of Obstetrics and Gynecology.)

Faith H. Holcombe, B.A., Radcliffe, 1976; M.D., Washington University School of Medicine, 1980. (See Department of Medicine.)

Clemens H. Jacques, B.S., University of California, 1949; O.D., 1949. (See Department of Ophthalmology.)

William Johnson, B.S., University of Missouri-Kansas City, 1977; M.D., University of Missouri-Columbia, 1981. (See Department of Pediatrics.)

A. Donna King, B.A., Western Maryland College, 1960; M.S.W., Washington University, 1966.

Richard Lazaroff, B.A., Brown University, 1974; M.D., St. Louis University, 1978. (See Department of Pediatrics.)

Darryl McKinney, B.A., Yale University, 1976; M.D., Washington University, 1980. (See Department of Obstetrics and Gynecology.)

Thomas C. McKinney, Jr., B.A., Illinois Wesleyan University, 1976; M.D., Washington University, 1980. (See Department of Pediatrics.)

Jerald Maslanko, M.D., Emory University, 1975. (See Department of Medicine.)

Casey A. Moauro, B.S., University of Illinois, 1977; M.D., 1981. (See Department of Obstetrics and Gynecology.)

Ralph Moller, B.S., The Johns Hopkins University, 1973; D.O., Kansas City College of Osteopathic Medicine, 1980.

Vivian Moynihan, B.S., University of Dayton, 1977; M.D., Ohio State University College of Medicine, 1980. (See Department of Obstetrics and Gynecology.)

G. Patrick O'Donnell, B.A., University of Kansas, 1972; M.D., Autonomous University of Guadalajara, 1977. (See Department of Medicine.)

John H. Rice, B.A., St. Louis University, 1976; M.D., University of Missouri at Columbia, 1980. (See Department of Medicine.)

Paul S. Simons, B.A., University of Texas, 1963; M.D., Washington University, 1967. (See Department of Pediatrics.)

Michael Spearman, B.S., Kansas State University, 1978; M.D., University of Kansas-Kansas City, 1982. (See Department of Medicine.)

Wanda Terrell, A.B., Washington University, 1975; M.D., 1979. (See Department of Medicine.)

David Tucker, B.S., University of Notre Dame, 1977; M.D., St. Louis University, 1981. (See Department of Medicine.)

James K. Turner, A.B., Washington University, 1949; M.D., 1953. (See Department of Pediatrics.)

Monica Ultmann, B.A., Oberlin College (Ohio), 1975; M.D., Columbia University College of Physicians and Surgeons, 1980. (See Department of Pediatrics.)

Patricia B. Wolff, B.A., University of Minnesota, 1968; M.D., 1972. (See Department of Pediatrics.)

BEAUMONT-MAY INSTITUTE OF NEUROLOGY

The Beaumont-May Institute of Neurology was established in 1955 by gifts from the Louis D. Beaumont Foundation, Mrs. Charles M. Rice, and Morton J. May. It is the purpose of the institute to foster basic and clinical research in neurology, with special reference to defects in the structure of the nerve cell which occasion important neurological disorders having a high incidence of prolonged disability.

THE IRENE WALTER JOHNSON INSTITUTE OF REHABILITATION

The teaching of rehabilitation is conducted by members of various allied health and medical specialty services. The Irene Walter Johnson Institute of Rehabilitation is a modern five-story building housing both clinical and research facilities. Its many programs serve adults and children with a wide variety of acute and chronic disabilities.

Director

Michael H. Brooke, M.B., B.Ch., Cambridge University, 1958. (See Departments of Neurology and Neurological Surgery and Preventive Medicine and Public Health.)

Director of Milliken Hand Rehabilitation Center

Paul M. Weeks, A.B., Duke University, 1954; M.D., University of North Carolina, 1958. (See Department of Surgery.)

Traineeship Elective

Traineeships in Physical Disability and Rehabilitation of eight weeks' duration may be elected during the interval between the end of spring trimester and beginning of the fall trimester by two students who have completed the first year of the medical school curriculum. Specific instruction is given by means of informal lectures, demonstrations, and seminars. The student becomes familiar with the techniques for defining the extent of physical disability and with various approaches to its treatment. Emphasis is placed on methods used in physical, occupational, and speech therapy, and on the specialized contributions to be made by psychology, social work, nursing, and vocational testing and counseling. Opportunity is made available for special emphasis on the rehabilitation of hand injuries and for participating in research activities of the Cardiac Rehabilitation Center.

Interests of the students will be met by arranging experience in rehabilitation at extramural facilities, including Jewish Hospital and community independent living centers.

Director of the Cardiac Rehabilitation Center

Ali A. Ehsani, M.D., Tehran University, 1956. (See Departments of Medicine and Preventive Medicine and Public Health.)

Co-Director of Orthopedic Center for Upper Extremity Rehabilitation

Paul R. Manske, B.A., Valparaiso University, 1960; M.D., Washington University, 1964. (See Department of Surgery.)

GRADUATE TRAINING

DIVISION OF BIOLOGY AND BIOMEDICAL SCIENCES

The Division of Biology and Biomedical Sciences, organized in 1973, is a consortium of eight university departments which together provide interdisciplinary training for Ph.D. students. This unique organization was formed because of the realization that research and training in modern biology transcend the limits of departmental structure. The faculty consists of members of seven preclinical departments in the School of Medicine—Anatomy and Neurobiology, Biological Chemistry, Cell Biology and Physiology, Genetics, Microbiology and Immunology, Pathology, and Pharmacology—and of the Department of Biology in the School of Arts and Sciences. These 230 faculty are affiliated with one or more of five broad training programs: Cell and Integrative Biology, Molecular Biology and Biochemistry, Neural Sciences, Plant Biology, and Population Biology. Faculty in these programs take responsibility for all Divisional activities, including recruiting, admissions, advising, and research training, and in addition many Divisional courses and seminars are offered by the participating faculty.

Currently over 300 graduate students are enrolled in the Division, including 100 students pursuing both the Ph.D. and the M.D. through the Medical Scientist Training Program (see page 16). Requirements for the Ph.D. in each Divisional Program are highly flexible. They include a series of courses tailored to a student's background and interests, qualifying examinations usually taken during the second year, execution of laboratory research, and defense of a dissertation generated through original scientific investigation. Although students enter the Division through an affiliation with one of the five programs, it is often possible for a student to transfer to another program as interests evolve. During the first year, advisers are appointed to assist students in selecting courses and seminars as well as to help them in choosing laboratories in which they will spend several months becoming acquainted with a particular area of scientific research. At the end of the first year, it is expected that each student will choose a research adviser, whereupon the student will be housed in one of the departments of the Division. Continued participation in both Divisional and departmental activities assures the versatility of interests developed during the first year.

Applications for admission to the Ph.D. programs of the Division are due no later than January 1 for matriculation the following fall. Admission is based on demonstrated ability, future promise, and the number of positions currently available. Applicants should have completed undergraduate training in biology, chemistry, or physics at a high level of scholastic achievement; such training should include courses in biology, genetics, chemistry (including analytical, or-



ganic, and physical), physics, and calculus. In exceptional cases, deficiencies in basic requirements may be made up by appropriate course selection during the first year of study. It is required that each applicant take both the aptitude and advanced tests of the Graduate Record Examination. Additional information and application for admission to the Ph.D. programs may be obtained by writing to the Office of Graduate Affairs, Box 8072, Washington University School of Medicine, 660 South Euclid Avenue, St. Louis, Missouri 63110. Students who wish to pursue both the Ph.D. and M.D. degrees must apply to the Medical Scientist Training Program (see page 16).

Students admitted to the graduate programs are guaranteed full stipend and tuition support contingent upon satisfactory performance. Currently the stipend is \$7,500 annually. For the 1987-88 academic year, the tuition fee for a full-time student is \$11,900 per year. This fee includes the cost of participation in the Medical Center Student Health Service. The Division provides support for its Ph.D. students from a number of sources, including federally funded training grants provided by the National Institutes of Health. Support through such grants is subject to payback agreement and taxability provisions appropriate to the award.

It is expected that each student in a Ph.D. training program will devote full time to that endeavor. The Division will not accept students for part-time study, nor will it enroll students interested in a Master's degree.

The following graduate courses are offered by the Division of Biology and Biomedical Sciences, and they are available both to Ph.D. and M.D. students who meet the prerequisites stated for the appropriate course. Those courses particularly relevant to a given department are cross-listed under the department in this *Bulletin*. Faculty members in charge of courses and their departmental affiliations are shown at the end of each course description.

Bio 401. Vertebrate Physiology

This three credit-hour lecture series covers comparatively the integrated functional operation of the organ systems of vertebrates, exclusive of the endocrine system. Credit 3 units. *Coles (Biology)*

Bio 404. Laboratory of Neurophysiology

Neural analysis of sensory information, and organization of neural activity will be electrophysiologically studied by students to find out how some of the interesting experiments in neurophysiology are actually performed. Resting and action potentials, excitation transmission, sound- and photo-reception, analysis of human and animal sounds, and psychological phenomena will be examined. Credit 3 units. *Suga (Biology)*

Bio 405. Physiological Basis of Acoustical Communication

Lectures and seminars in hearing and acoustic signals of animals, from invertebrates to humans. Structural and functional adaptation for processing the signals for communication and echolocation are considered. Credit 2 units. *Suga (Biology)*

Bio 408. Human Evolution

The fossil evidence for human and nonhuman primate evolution. Classification and genetics in evolutionary perspectives, relations between biology and culture in ancient and modern populations. Credit 3 units. *Molnar (Biology)*

Bio 410. Molecular Virology

A comprehensive study of the virus world, including animal, plant, and bacterial viruses, with emphasis on the molecular biology of virus structure and replication. This course is for advanced undergraduate and graduate students. Graduate students are expected to read original papers and participate in discussion groups. Credit 3 units. *M.J. Schlesinger; S. Schlesinger; Beachy (Microbiology/Immunology)*

Bio 411. Phycology

A systematic treatment of the freshwater and marine algae. Emphasis primarily on morphology, physiology, taxonomy, and genetics of the major and minor algal groups. Certain aspects of recent research and present problems in phycology will be considered. Credit 4 units. *Nichols (Biology)*

Bio 412. Experimental Aquatic Biology

Studies of current research problems and research techniques devoted to aquatic flora and fauna. The course will include group or individual participation in a research problem or problems dealing with individual aquatic components of the aquatic environment or their interaction. Credit 4 units. *Nichols (Biology)*

Bio 4132. Plant Diversity

Concepts of classification and specification emphasizing the diversity of flowering plants. Laboratory focuses on evolutionary mechanisms utilizing accepted systems of angiosperm phylogeny. A seven-week course, first in a series of four. Credit 2 units. *B. Stein (Biology), Staff*

Bio 4133. Plant Molecular Biology

Discussion of molecular aspects of plant development, genetics of the organelles, host/symbiont interactions, plant genetic engineering. A seven-week course, second in a series of four, beginning in the eighth week of the semester and continuing through the fourth week of spring semester. Credit 2 units. *Beachy (Biology)*

Bio 4134. Physiology and Biochemistry of Plants

A discussion of those processes unique to plants. These include photosynthesis, symbiotic nitrogen-fixation, nitrate reduction, sulfate reduction, osmoregulation, hormone metabolism, and photomorphogenesis. A nine-week course, last of a series of three, beginning in the fifth week of the semester. Credit 3 units. *Ho, Kohl, Pickard (Biology)*

Bio 4151. Theoretical Population Genetics

A rigorous introduction to the theoretical basis of population genetics and evolutionary mechanisms. Quantitative genetics and population structure will be investigated first, followed by an examination of how selection, population structure, and ecological factors interact in determining the evolutionary fate of a population. Credit 3 units. *Templeton (Biology)*

Bio 417. Mathematical Ecology

The theory of the Leslie Matrix will be developed with respect to population growth, colonization, demography, and evolution of life history attributes. Matrix approaches will next be used to study species interactions and communities. Finally, the use and limitations of optimization models in ecology will be discussed. Credit 3 units. *Templeton (Biology)*

Bio 4181. Population Genetics

An introduction to the basic principles of population and ecological genetics. The mechanisms of micro-evolutionary processes are discussed, and an integrated ecological and genetic approach is used to study the adaptive nature of the evolutionary process. Credit 3 units. *Templeton (Biology)*

Bio 419. Ecology

A survey of ecological principles underlying the spatial and temporal distribution of populations and biological communities. Credit 3 units. *Sexton (Biology)*



Bio 4201. Selected Topics in Life History: Strategies of Tetrapod Vertebrates

Lectures, discussions, and laboratory field trips devoted to the analysis of vertebrate life tables, growth, reproductive cycles, predation, and distribution in space and time, with special reference to amphibians and reptiles. Individual research projects will be required. Credit 3 units. *Sexton (Biology)*

Bio 424. Immunology

The basic molecular and cellular aspects of the vertebrate immune response, emphasizing the specificity of immune reactions, the structural and genetic basis of antibody diversity, and the cellular mechanisms involved in antigen recognition and the formation of specific immune responses. Other topics: regulation of immunity, allergy, tissue transplantation, and mechanisms of complement activation. Credit 3 units. *Fleischman (Microbiology and Immunology)*

Bio 437. Laboratory on DNA Manipulation

Isolation of DNA, use of restriction endonucleases, electrophoretic separation of DNA fragments, Southern blotting, *in vitro* labeling of nucleic acids, and DNA hybridization will be covered. A molecular cloning experiment employing colony hybridization will be performed by each student. Credit 4 units. *Clark (Biology)*

Bio 441. Problems in Developmental Biology

Some basic problems related to organismic development (such as the regulation of gene expression, cell-cell interaction, pattern formation) will be examined. Students will be introduced to each subject through lectures on both classical and modern experimental work. In-depth discussions of current papers in each area will be emphasized. In-depth discussion on current approaches will be emphasized. Credit 3 units. *Kirk, Duncan (Biology)*

Bio 445. Microbial Genetics

A course providing lectures and laboratory experience on: mutation, mutagenesis, and mutant isolation; bacteriophage genetics; gene transfer by transformation, transduction, and conjugation; and complementation analysis and gene regulation. Credit 4 units. *Curtiss (Biology)*

Bio 446. Biology of the Fungi

General aspects of the biology of the major fungal groups, including their development and genetics, cell biology, metabolism, and ecology. Roles these microorganisms play in nature, research, medicine, industry, and agriculture. Selected living representative species studied in laboratory, with appropriate exercises on pure culture and isolation techniques and studies of morphology, growth, physiology, fermentation, cytology, life cycles, genetics, and identification procedures. Credit 3 units. *Maniotis (Biology)*

Bio 448. Plant Systematics Workshop

A series of workshops, each consisting of laboratories and tutorials for advanced undergraduates and graduates contemplating careers in systematics, ecology, or natural history: Section 1—monographic studies; Section 2—cytotaxonomy; Section 3—palynology; Section 4—microtechnique; Section 5—chemosystematics. Credit 1 or 2 units for each section. *Staff (Biology)*

Bio 449. Microbiology

A lecture course covering the growth and regulation of both prokaryotic and eukaryotic microbes and their viruses, with emphasis on gene regulation, molecular biology, physiology and growth. Credit 3 units. *Staff (Biology)*

Bio 450. Topics in the History of Eugenics

A research seminar in which students will carry out in-depth research projects on eugenics movements in the United States or Europe (1890-1960). Topics can include: genetic basis of eugenic theories, funding of the Eugenics Movement, connections between U.S. and other (e.g., Nazi) eugenics movements, etc. Credit 3 units. *Staff (Biology)*

Bio 451. General Biochemistry

A study of structure-function relationships as applied to carbohydrates, proteins, and lipids; intermediary metabolism of principal cellular components and general aspects of regulation. Credit 4 units. *Rhodes (Biology Chemistry)*

Bio 452. Biochemistry Laboratory

An experimental approach to selected biochemical problems, with primary focus on the isolation and characterization of proteins. Examples of both enzymatic and non-enzymatic proteins are studied. Credit 3 units. *Chilson (Biology)*

Bio 454. History of Genetics

A seminar dealing with selected topics in the history of genetics, focusing largely on the period since 1900. The first part of the seminar (weeks 1-7) will be devoted to exploration of specific topics (with primary and secondary source readings) such as: the background development of Mendel's work, cytology (1860-1930); the biometrical movement, heredity, and evolution (1860-1900); the rediscovery of Mendel, the chromosome theory and the Morgan school; Mendelism and Darwinism (1900-1940); biochemical genetics, molecular genetics, and the Eugenics Movement (1890-1940). The second part of the course will be devoted to presentation and discussion of student research papers. Credit 3 units. *Allen (Biology)*

Bio 459. Vision

A course designed to bring together the anatomy, physiology, psychology, and cell biology of vision to provide an understanding of function. Properties of light and receptors; analysis of form, movement, color, and depth in the vision of vertebrates, with some material on invertebrates. Credit 3 units. *Daw (Cell Biology and Physiology), Brown, Cohen, Miller, Pearlman*

Bio 462. Plant Population Biology

Theoretical and experimental aspects of plant population genetics and ecology. Topics include the genetic structure of native plant species, demography, life-history evolution, coevolution, and species-species interactions. Credit 3 units. *Schaal (Biology)*

Bio 471. Phytogeography

An introduction to the current and past geographical distributions of plants, emphasizing ecological, geological, and historical factors. Credit 3 units. *Gentry (Biology)*

Bio 487, 488. Undergraduate Teaching

Exceptional undergraduates may serve as teaching assistants for laboratory and/or discussion sections in departmental courses. Normally, 2 or 3 credits are given per semester for teaching activity, subject to the approval of the course instructor and the Department. Credit for teaching may not be counted toward fulfilling biology degree requirements. Students who are asked to teach, or those who apply and are accepted by a course instructor, should fill out an application form to be obtained from the Biology Department office. Credit 2 or 3 units. Must be taken Credit/No Credit only. *Staff (Biology)*

Bio 493. Seminar in Advanced Biology

This seminar will deal with topics which tend to cut across disciplinary lines within Biology. Topics, staff, and prerequisites will vary from semester to semester and will be announced during the prior preregistration period. Credit to be arranged. *Staff (Biology)*

Bio 500. Independent Work

Prerequisite: junior standing and permission of the sponsor and the Department. Credit to be determined in each case. Maximum of 6 units may be applied toward upper division credits required for the major. If the work is to be submitted for honors, further requirements are a B+ average in biology courses, a B+ average in related subjects required for a biology major, a B+ average overall, and registration for 3 units in each of 2 semesters. Credit/No Credit only. *Staff (Biology)*

Bio 501. Human Anatomy

Study of the gross structure of the human body primarily by dissection. Consent of the instructor required. Credit 6 units. *Conroy (Anatomy), R. Bunge, Nemeth, Peterson, Phillips-Conroy*

Bio 502. General Physiology

This course applies the fundamental physiological mechanisms of cell biology to the functions of the major organ systems of the body, namely, the cardiovascular, renal, respiratory, gastrointestinal, and endocrine systems. The course is intended primarily for first-year medical students. Credit 6 units. *Rovainen, Staff (Cell Biology and Physiology)*

Bio 504. Environmental Pathology

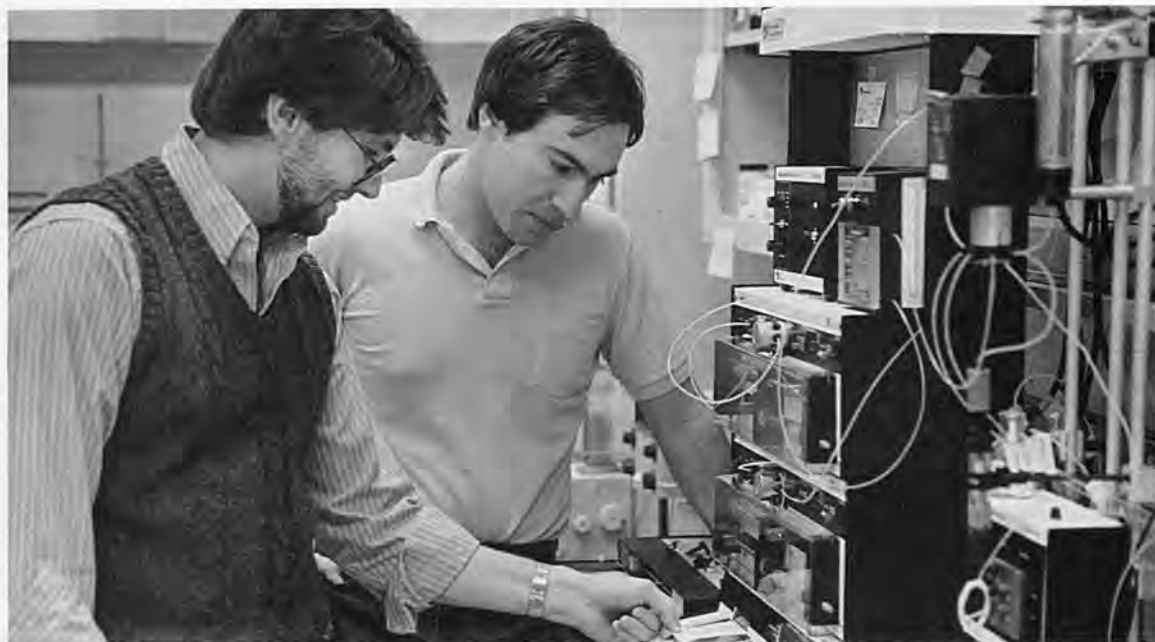
Lectures and seminars discussing the effect of modern industrial environment on man's health. The adaptability of man, his ability to manipulate his environment and the effects of these manipulations in regard to health and disease will be discussed. Topics include acute and chronic diseases associated with air and water pollution, waste disposal, pesticide usage, transportation, radiation, and noise. Credit 2 units. *Kuhn (Pathology), Schmidt, Dresler*

Bio 5051. Foundations in Immunology

An in-depth introduction to immunology designed for graduate students. Topics: antibody structure and genetics, B cell recognition, T cell receptor, major histocompatibility complex, T cell recognition, regulation of the immune response, immune mediators, humoral and cellular effector mechanisms, immune control of infectious disease, immunopathology including hypersensitivity and deficiency. Credit 3 units. *Cullen (Microbiology and Immunology)*

Bio 506. Microscopic Anatomy

The structure of cells, tissues, and organs is studied with regard to the functional significance of the morphological features. The laboratories consist of the study of prepared slides, of preparations of fresh tissues, and of electron micrographs. A microscope will be provided for each student. Credit 4 units. *Menton (Anatomy and Neurobiology)*



Bio 5061. Cell Biology

An introduction to cell biology and cell physiology. The approach is organized in the following sections: fundamentals of membrane transport, endocytosis, exocytosis and bulk membrane flow, biogenesis and function of cellular organelles, the cytoskeleton, the biology of mitosis, the extracellular matrix, and cell-cell interactions. Four lectures each week during the first medical school trimester, supplemented with demonstrations and small group conferences. Focuses on problem sets and discussion of recent and/or classical publications. (Optional—during the last 6 weeks of the course, regular meetings will be reduced to 1 hour per week for discussion of literature and preparation of a short research proposal. Any faculty member of the Cell Biology Program can serve as an advisor for the research proposal.) Credit 4 or 5 units (5 if optional tutorial is taken.) *Stabl (Cell Biology and Physiology), DeWeer*

Bio 507, 508. Pharmacology

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular, neuropharmacology. Bio 508 must be taken in the spring semester to complete the course. Credit 4 units. *Covey (Pharmacology), Staff*

Bio 5081. Molecular Basis of Mediator Action

In this course a limited number of neurotransmitters, hormones, and interleukins are used in order to analyze recent advances in understanding the mechanisms of action of intercellular messengers. The analysis includes a consideration of potential second messenger molecules (cyclic nucleotides, inositol phosphates, Ca^{+2} , H^{+}), sites of actions of these intracellular mediators, and molecular mechanisms responsible for eliciting the biological response in the target cells. Credit 2 units. *Russell (Pharmacology)*

Bio 509, 510. Current Topics in Pharmacology

Topics of current interest presented and discussed. Critical evaluation will be made of recent articles in the scientific literature. Required of all graduate students in the department. Credit 1 unit. *Russell (Pharmacology)*

Bio 5111. Intracellular Transport of Macromolecules in Animal Cells

A discussion of the organelles responsible for the movement of macromolecules in cells. Endoplasmic reticulum, the Golgi apparatus, secretory vesicles, plasma membrane, endosomes, lysosomes. Emphasis will be placed on specific recognition as a means for translocation of macromolecules. Part of the course will use the seminar format. Credit 2 units. *Stabl (Cell Biology and Physiology)*

Bio 512. Selected Topics in Developmental Biology

A lecture-seminar course devoted to an in-depth analysis of a restricted number of topics of major current interest in developmental biology. A series of guest lecturers whose research is at the forefront of the area of interest will be invited to the campus to discuss their research activities with the class. These guest lectures will be supplemented by extensive readings from the current literature, lectures by local faculty, and informal discussions. Students will be evaluated on the basis of a research proposal they will prepare during the semester. Credit 2 units. *Duncan (Biology)*

Bio 5141. Advanced Cell Biology

A course designed for advanced students in the area of cell biology and related fields. Lectures and readings stress recent advances in selected areas of eukaryotic cell biology. This year the focus is on changes in cell behavior mediated by cell-cell and cell-extracellular matrix interactions. Credit 3 units. *Goodenough (Biology), Kirk*

Bio 515, 516. General Pathology

General introduction to abnormal biology and detailed consideration of pathology of organ systems. Continuous through two semesters, 312 hours; 9 hours per week. *Not* available for credit to those holding M.D. degrees. Credit 10 units for the year. *Staff (Pathology)*

Bio 5171. Medical Immunology

An introduction to basic concepts in immunology and immunopathology. Lectures will focus on antigen-antibody interactions, immunoglobulin structure and genetics, the cellular basis of the immune response and immune regulation, T cell effector mechanisms, the inflammatory response, complement, the positive and negative roles of hypersensitivity, and immune deficiency. Credit 2 or 3 units. *Fleischman (Microbiology/Immunology)*

Bio 518, 519. Pathology Research Seminar

Graduate students, MSTP students, postdoctoral trainees, and pathology faculty will present discussions of current research from the literature, or, when appropriate, from their own laboratories. Priority for presentation given to graduate and MSTP students. Credit: those wishing to obtain credit may do so (2 units/semester). *Baenziger (Pathology)*

Bio 5202. Microbiology and Infectious Diseases

Pathophysiology of infectious diseases taught from the standpoint of principles of pathogenicity; and relevant microbial physiology and ecology. Credit 3-4 units. *D. Schlessinger (Microbiology/Immunology)*

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research on pathogenic microorganisms and their virulence determinants. Emphasis on new research strategies for studying the molecular mechanisms of pathogenesis and the factors controlling host-pathogen interactions. One and a half class hours per week, 1 unit credit. *Goldman (Microbiology/Immunology)*

Bio 525. Fundamental Concepts in Cell Membrane Physiology and Biophysics

A lecture course on the theoretical principles underlying the physiological properties of biological membranes. Topics include: (1) a review of aqueous solution thermodynamics and properties of electrolyte solutions; (2) diffusion and osmosis; (3) electrodiffusion, with applications to membranes; (4) membrane potentials and interfacial potentials; (5) kinetics and selectivity of ion channels; and (6) kinetics and thermodynamics of carrier-mediated transport. Credit 3 units. *De Weer (Cell Biology and Physiology)*

Bio 526. Selected Topics in the Physiology and Biophysics of Cell Membranes

A seminar course devoted to in-depth analysis of selected readings. The topics to be covered include: ionophorous antibiotics and artificial membranes; movements of salt and water across organelle and cell membranes and epithelia; ion channels in biological and artificial membranes; kinetics of carrier mechanisms; and the chemistry and kinetics of the sodium pump. Credit 3 units. *De Weer (Cell Biology and Physiology)*

Bio 5271, 5272. Topics in Immunology

Consideration of two or three changing topics in immunology. Background observations and current problems in the topic areas examined in a seminar format using primary literature. Each topic segment led by a different faculty member. Credit 2 units. *Pierce (Pathology, Microbiology), Staff (Cell Program)*

Bio 5274. Soluble Mediators of Immunity

This course will examine the cellular and soluble agents responsible for inflammation. Specific attention will be given to the molecular and cellular basis for the manipulation of the inflammatory response by endogenous regulatory cytokines and exogenously administered immunomodulators. Particular emphasis will be given to biochemical mechanisms of signal transduction as they relate to inflammatory cells; the basis of immediate and delayed-type hypersensitivity; and the role of various cytokines and other soluble agents in the initiation, maintenance and resolution of the inflammatory response. The format for the course will consist of a mixture of didactic lectures and student presentations of relevant literature. Students will be evaluated on their participation in class discussion and a written report related to the topics discussed. Credit 2 units. *Russell (Pharmacology), Kulczycki (Microbiology/Immunology) and Schreiber (Pathology)*

Bio 5275. Molecular Immunology

Intensive discussions on current topics in immunology, stressing molecular approaches. Course is appropriate for immunology students or those in Molecular Biology who wish to have more exposure to eukaryotic molecular genetics. Credit 2 units. *Loh (Microbiology/Immunology), Korsmeyer, Chaplin*

Bio 5281. Developmental Genetics

Genetics of developmental events, including sex determination, pattern formation, cell fate, and regulation of tissue specific genes. Emphasis will be placed on the use of genetics to investigate these phenomena in organisms such as yeast, *C. elegans*, *Drosophila*, and mouse. Credit 3 units. *Waterston (Genetics), Staff*

Bio 5291. Intracellular Mediators and Regulation of Cellular Function

Specific examples of regulatory mechanisms including transmembrane and intracellular signal transduction. Emphasis will be placed on common intracellular mechanisms for coupling receptor-ligand interaction with biological response. Credit 3 units. *Russell (Pharmacology), Pike (Biochemistry), Lawrence, Nerbonne (Pharmacology)*

Bio 5301. Laboratory Computer Programming

Basic computer skills are taught, covering the PASCAL programming language and the VAX/VMS operating system. A series of problems illustrate general concepts, including files access, data structures, graphics, and signal processing. The goal of the course is to provide students with a practical grasp of programming tools to serve their research needs. Credit 3 units. *Holmes (Biochemistry)*

Bio 531. Advanced Biochemistry

A course divided into several segments. The major eight-week segment deals with the regulation and integration of metabolic pathways. Highly motivated students with no biochemistry background will receive intensive instruction for three weeks prior to this segment. In the final segment, the class divides into small "interest groups" which examine in detail various topics at the forefront of biochemistry. This section of the course requires extensive reading of the original literature and active student participation. *Frieden (Biochemistry)*

Bio 532. Biochemistry of Extracellular Matrix

An in-depth survey of the chemistry and metabolism of the principal components of the extracellular matrix, principally collagen, elastin, and the glycosaminoglycans. Chemical and physical properties of these molecules will be discussed, as well as their biosynthesis and degradation. Emphasis will be placed on the relationships between structural features and metabolic events involving these complex molecules and their physiologic function: the maintenance of the stable three-dimensional architecture of animal tissues. Credit 2 units. *Jeffrey (Biochemistry)*

Bio 5341. Principles of Gene Manipulation

An introduction to the techniques of *in vitro* mutagenesis and sequencing of DNA, with hands-on laboratory experience. Designed for graduate students nearing the completion of their rotation schedule, and especially for those who expect to enter research laboratories in which gene manipulation is not yet practiced. Credit 4 units. *Barnes (Biochemistry)*

Bio 5351. Molecular Biology

Basic principles of prokaryotic and eukaryotic molecular biology. Credit 3 units. *Gordon (Biochemistry)*

Bio 536. Physical Chemistry of Macromolecules

Application of physical chemistry to the study of proteins, nucleic acids, and other natural and synthetic polymers. Thermodynamics and statistical mechanics of macromolecular solutions, including conformational transitions, and the molecular interpretation of osmotic pressure, light scattering, viscosity, sedimentation, and diffusion experiments. Offered in alternate years. Credit 3 units. *Holtzer (Chemistry)*

Bio 537. Protein Chemistry & Enzyme Mechanisms

Protein chemistry; sequence analysis; three-dimensional protein structure; development of enzyme kinetic theory, including concepts of regulatory enzymes; enzyme mechanisms. Credit 3 units. *Banaszak (Biochemistry), Staff*

Bio 538. Structure & Function of Cell Membranes and Surfaces

With allowance for different emphasis in different years, topics include: contemporary cell membrane models; membrane structure as revealed by electron microscopy, X-ray analysis, etc.; physical properties of lipids and membrane proteins; model membranes and their applications; permeability and active transport in mammalian and bacterial systems; cell recognition, contact inhibition, and transformation; immunological characteristics of membranes. Credit 3 units. *R. Kornfeld (Biochemistry/Medicine), Staff*

Bio 539. Topics in Animal Virology: The Molecular Biology of Animal and Plant Viral Diseases

RNA and DNA virus replication, shutoff of host protein biosynthesis, interferon, retroviruses with emphasis on chronic diseases (i.e., visna, AIDS), defective viruses (i.e., satellite RNA of tobacco ring spot virus, hepatitis delta virus), viruses as vectors and their possible role in preventing disease. Course consists of lectures and discussions of original papers. Credit 3 units. *M. Schlesinger (Microbiology and Immunology), S. Schlesinger, Beachy (Biology), R. Thach*

Bio 5404. Molecular Neurobiology

This course will cover the molecular biology and biochemistry of synaptic function, receptor recognition and regulation. Topics will include the structure and function of neurotransmitter receptors, ion channels, and the mechanisms involved in the metabolism, storage, and release of neurotransmitters. Examples will be chosen (from cholinergic, adrenergic and peptidergic systems) to illustrate applications of biochemistry and molecular biology to the analysis of these areas. Lectures, problem sets, reading and presentation of original articles. Credit 4 units. *J. Cohen (Anatomy and Neurobiology), Neural Science Staff*



Bio 5413. Topics in Molecular and Cellular Biology

A weekly journal club discussing articles of current interest in the field of molecular and cellular biology. Credit 1 unit, contingent on one presentation per year. *Ho (Biology)*

Bio 5421, 5422. Topics in Gene Expression

A weekly journal club discussing articles of current interest in the field of gene expression. One unit credit, contingent on one presentation per year. *Johnston (Genetics)*

Bio 5432. Regulatory Phenomena in Cell and Molecular Biology

Two seven-week sessions consisting of intensive lectures and discussion of current research. Topics will vary from year to year. Each session may be taken independently. Credit: 1-4 units. *S. Elgin (Biology), J. Taylor (Chemistry), M. Olson (Genetics)*

Bio 5442. Cell and Membrane Biology and Molecular Mechanisms of Disease

Course will have three components: protein sorting and membrane receptor synthesis and recycling; receptors and signal transduction; growth factors, oncogenes and their receptors. Examples of pathologic conditions (such as cancer) due to defects in these systems will be emphasized. Credit 3 units. *S. Kornfeld (Hematology)*

Bio 5451. Introductory Biophysical Chemistry

Introductory physical chemistry with emphasis on biochemical applications. The course offers an introduction to chemical thermodynamics, spectroscopy, and other physical methods used in the life sciences. Designed for students with no background in physical chemistry. Credit 3 units. *Banaszak (Biochemistry)*

Bio 5461. Molecular Recognition

The physical basis of molecular recognition as exemplified in biological systems will be examined from several viewpoints: quantum chemistry, molecular mechanics, molecular dynamics and Monte Carlo simulations, and structure-activity relations. Molecular modeling and computer graphics techniques as well as current approaches in quantitative structure-activity relations based on correlation of physical properties of drug molecules, and computer-aided drug design will be reviewed. Credit 3 units. *Marshall, Covey (Pharmacology), Dammkoehler (Computer Science)*

Bio 548. Nucleic Acids & Protein Biosynthesis

This course will cover fundamental aspects of the structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis will be placed on mechanisms involved in the biosynthetic processes and the regulation thereof. Credit 3 units. *Olson (Genetics), Boime (Pharmacology)*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological problems. Examples drawn from bacteria, maize, yeast, nematodes and fruit flies. Credit 3 units. *Waterston (Genetics), Johnston*

Bio 5492. Molecular Approaches to Human Genetics

In-depth review of recent advances in human genetics. Topics include molecular basis of color vision, muscular dystrophy, thalassemia, hyperlipidemia, chromosomal abnormalities in tumorigenesis, sex chromosomes, gene therapy, and RFLP analysis. Credit 2 units. *Loh (Medicine/Microbiology)*

Bio 550. Medical Genetics

Lectures on topics including population and quantitative genetics, clinical cytogenetics, biochemical genetics and metabolic defects, counseling, and immunogenetics. Credit 2 units. *Levine (Genetics)*

Bio 5522. Memory

A seminar course exploring some of the experimental and theoretical approaches to understanding the biological basis of memory. Participants will read and discuss original literature with the goal of deciding what are (and are not) potentially useful avenues into this poorly understood phenomenon. Credit 3 units. *Purves (Anatomy and Neurobiology), Lichtman*

Bio 554. Neural Sciences

The course consists of a consideration of cellular aspects of the nervous system and of the neural systems of the brain and spinal cord. This course will be offered during the third medical school trimester. Credit 5 units. *Lichtman, Price (Anatomy and Neurobiology)*

Bio 5562. Neural Development

The course is an integrated and comprehensive review, including the history of major ideas and figures in this field, an overview of current research, and a discussion of present controversies. Selected topics include early neural development, synapse development, stability and specificity, NGF and trophic factors, development of behavioral neurobiology, extracellular matrix and cell surface, growth cone biology and function, glial cells, and cortical development. The course will be based on the book *Principles of Neural Development* by Purves and Lichtman and discussion of original literature. Credit 4 units. *R. Bunge, D. Purves, M. Johnson, J. Lichtman (Anatomy and Neurobiology)*

Bio 5571. Cellular Neurobiology

A survey of the basic principles of nerve cell structure and function, including quantitative analysis of voltage and chemically gated ion channels, synaptic transmission and sensory transduction. Lectures, laboratories and conferences supplemented with readings of classic and contemporary papers. Credit 4 units. *Steinbach, Staff (Anatomy/Neurobiology)*

Bio 559. Nerve, Muscle, and Synapse

The ionic basis of the resting, action, and after-potentials and the mechanisms of synaptic transmission. Students will be expected to present 2 one-hour seminars based on assigned original papers. Credit 2 units. *Rovainen (Cell Biology and Physiology)*

Bio 5611. CNS Efferent Control of Sensory Function

The CNS can potentially modulate all incoming sensory information by the efferent control of primary sensory organs. Examples are the efferent vestibular and auditory systems, the efferent visual system of birds (isthmo-optic) and the efferent control of photoreceptors in Limulus. The neurobiology of these and other efferent systems will be studied. This course is intended for advanced graduate students. Credit 2 units. *Higstein, Steinacker (Anatomy and Neurobiology)*

Bio 5651. Neural Systems

Introduction to the structure and function of the major systems within the central nervous system. Selected topics are chosen to provide an overview of the brain with emphasis on major general concepts. Laboratories and readings of the primary literature are an integral part of this course. Credit 4 units. *Daw (Cell Biology and Physiology), Price, R. Thach (Anatomy and Neurobiology), Staff*

Bio 5661. Topics in Vision Research

Mechanisms of transduction and adaptation in photoreceptors; retinal circuitry and transmitters; development, structure and function of post-retinal visual areas; effects of visual deprivation. Credit 3 units. *A. Cohen (Anatomy and Neurobiology)*

Bio 567. Advanced Tutorials in Neural Sciences

Directed readings and discussions for graduate students on selected topics in advanced neural science. Topics and specific instructors to be listed at Registration. Each tutorial will last for 6 weeks. Credit 1-3 units, depending on how many sessions taken. *J. Cohen (Anatomy and Neurobiology), Staff*



Bio 568. Introduction to Principles of Neuropharmacology

Basic principles of pharmacodynamics, action of drugs affecting the autonomic nervous system, receptor binding, etc. Credit 2 units. *E. Johnson (Pharmacology)*

Bio 572. Seminar in Plant Biology: Plant Biochemistry

Discussion of current research and concepts of morphogenesis, growth, and development. Credit 2 units. *Staff (Biology)*

Bio 575. Advanced Studies in Plant Systematics

Seminars in specific topics including anatomy, chemotaxonomy, cytology, ecotaxonomy, embryology, nomenclature, palynology, phytogeography, and bibliography. Credit 1 unit a semester. *Staff (Biology)*

Bio 580. Seminar in Population Biology

This weekly seminar, covering topics in both population genetics and ecology, will be taken by graduate students in this program each semester. Research and literature reports will be given by staff, visitors, and graduate students. Credit 2 or 3 units. *Staff (Biology)*

Bio 581. Seminar in Techniques in Field Biology

Planning and presentation of techniques in selected areas of population biology. Credit 3 units. *Staff (Biology)*

Bio 585. Seminar in Floristic Taxonomy

A survey of angiosperm families, their morphology, cytology, anatomy, palynology, chemistry, and evolution. Credit 1 unit. *Gentry (Biology)*

Bio 586. Structure and Composition of Tropical Forests

An introduction to tropical forest ecology and floristics, emphasizing the unique features that make these the most complex ecosystems on earth. Focus on patterns of structural and taxonomic diversity, pollination and dispersal biology, floristic composition, and the recognition of the distinguishing features of major tropical forest plant taxa. Credit 2 units. *Gentry (Biology)*

Bio 590. Research

Credit to be arranged. *Staff (Biology)*

Bio 5911. Seminar in Biology and Biomedical Sciences

These seminars cover the recent literature in various areas not included in other courses, or in more depth than other courses. Credit to be arranged. *Staff*

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

PROGRAM IN BIOMEDICAL ENGINEERING

This course of graduate study is designed to provide education and training for students wishing to apply principles of modern engineering and mathematics to theoretical and practical problems in biology and medicine. Students and faculty of both the School of Engineering and Applied Science and the School of Medicine participate in the program.

Every student seeking an advanced degree in engineering must be admitted to one of the participating departments of the Sever Institute of Technology, the graduate division of the School of Engineering and Applied Science. The program permits the student to earn a certificate in biomedical engineering in addition to the M.S. or D.Sc. degree in a chosen engineering field. Students who are not candidates for a degree are welcome to take courses as electives.

Graduate study plans are tailored to the individual's needs and interests, and provide essential background in the related areas of life and medical sciences. Students with diverse undergraduate backgrounds may be admitted provided they have adequate preparation and experience in mathematics and the physical sciences. Areas of specialization include sensory communications, electrocardiography, flow and diffusion in biological systems, electrobiology, technology in health care, modeling of biological systems, engineering of artificial organs, drug concentration control, and applications of advanced computer techniques to biology and medicine. Research facilities available to the program are located in the School of Engineering and Applied Science, the School of Medicine, and the Washington University Computer Laboratories. The

faculty includes representatives from the Biomedical Computer Laboratory; the Departments of Biological Chemistry, Cell Biology and Physiology, Preventive Medicine and Public Health, Radiology, and Anatomy and Neurobiology in the School of Medicine; and the Departments of Computer Science, Chemical, Civil, Electrical, and Mechanical Engineering in the School of Engineering and Applied Science.

Complete course listings and information about application and degree requirements may be found in the *Bulletin of the School of Engineering and Applied Science*.

Biomedical Engineering course offerings:

BMed 502. Mathematical Methods in Biophysics

BMed 547. Biological Mass and Momentum Transfer

BMed 560. Biomechanics

BMed 576. Sensory Communications

BMed 582. Biophysical Measurement

BMed 585. Ion Selective Channels in Cell Membranes

BMed 600. Research for Doctoral Dissertation

BMed 651. Science of Synthetic and Biological Polymers

BMed 660. Biomedical Applications of Small Digital Computers

BMed 693. Special Topics in Biomedical Engineering

For additional related courses, see Biomedical Computer Laboratory in this *Bulletin* and the *Bulletin of the School of Engineering and Applied Science*.

Faculty

Professor and Chairman

Harold W. Shipton

Professors

R. Martin Arthur
Jerome R. Cox, Jr.
John L. Kardos
James G. Miller
Charles F. Molnar
William F. Pickard
Marcus E. Raichle
Robert E. Sparks
Salvatore P. Sutera
Michel M. Ter-Pogossian
Curt Thies

Reimut Wette
George I. Zahalak

Associate Professors

Stuart Boxerman
William F. Holmes
Robert F. Miller
Thomas R. Miller
Stanley Misler
Lewis J. Thomas, Jr.
John Wong

Senior Research

Associate

Norbert S. Mason

Research Associate

Kenneth B. Larson

ALLIED HEALTH PROFESSIONS

Programs are conducted by the School of Medicine in health administration, occupational therapy, physical therapy, radiologic technology, and nurse anesthesia. All courses are approved by the American Medical Association or other certifying agencies, and graduates qualify for certifying examinations. For further information, write to the director or educational director listed under the particular program, 660 South Euclid Avenue, St. Louis, Missouri 63110.

HEALTH ADMINISTRATION PROGRAM

The Philosophy

The faculty of the Health Administration Program of Washington University believes that administrative personnel in health organizations require not only a solid foundation in management but also an understanding of those aspects of finance, regulation, and planning unique to the health care field. Additionally, since its inception in 1946, the program has acted on the premise that health administration students would benefit from exposure to the environment in which they will ultimately be involved. To this end the program has maintained an organizational structure consisting of a core faculty located within the School of Medicine, augmented by faculty from other schools

and departments within the University, as well as affiliated institutions and agencies. This multidisciplinary approach enables the student to acquire not only specific management skills but an understanding of the many complexities unique to the health care sector.

Curriculum and Sequence of Study

Required courses constitute 62 percent of the course sequence for the master of health administration degree, offering vital exposure to the generic knowledge in the health administration and planning area. In addition to the elective courses available within the Health Administration Program (HAP), students may take up to 15 semester hours of graduate work in other units of Washington University. The HAP student's faculty adviser must approve the selection of courses in the student's individual curriculum. The student's previous academic work, employment experience, and ultimate performance goals enter into the individual's personalized curriculum.

As a means of furthering interdisciplinary study, up to 15 semester hours of HAP courses are open to interested graduate students from other areas of Washington University. There is also a joint M.H.A.-J.D. degree between the Health Administration Program and the School of Law, and a joint M.H.A.-M.B.A. degree between the Health Administration Program and the graduate school of Business Administration. In addition, there are joint degrees that are under development between the Health Administration Program, the George Warren Brown School of Social Work, and the School of Architecture.



The sequence of study requires two years, each consisting of a fall and spring semester. Upon completion of the four semesters, or a total of 60 units, the student will receive a master of health administration (M.H.A.) degree conferred by Washington University. The statute of limitations is five years from the date of matriculation to complete all requirements for the M.H.A. degree. Contingent upon graduation the student has the option of pursuing a 12-month postgraduate administrative residency/fellowship. A certificate will be awarded by Washington University School of Medicine and the affiliated residency organization upon completion of the residency/fellowship.

Administrative Residency/Fellowship

The 12-month optional postgraduate administrative residency/fellowship will be served in a hospital, health agency, or health organization which has been recommended and approved by the full-time faculty. This option is available only to those persons who have the M.H.A. degree conferred upon them by Washington University. The purpose of the residency/fellowship is to provide the graduate with an opportunity to observe and practice those concepts and principles learned during the didactic on-campus exposure. The administrative residency/fellowship is strongly recommended, as this postgraduate clinical exposure is deemed necessary for adequate professional career preparation. The residency/fellowship is completed under the direction of a well-qualified and experienced health care administrator who is given an annual adjunct faculty appointment at Washington University School of Medicine.

The full-time faculty maintains close liaison with the administrative resident/fellow and the preceptor. An educational plan which outlines the resident's activities for the coming year must be filed by the preceptor. The preceptor also sends two evaluation reports to the Director of HAP and shares the responsibility for recommending awarding of the certificate by Washington University School of Medicine and the residency/fellowship site organization.

Within available resources an on-campus faculty member visits the site to meet with the preceptor and resident. HAP also sponsors an annual preceptors conference at Washington University. Interaction of these

site and campus visits enables joint review of the resident's progress, as well as evaluation and refinement of the administrative residency/fellowship experience.

Admission Requirements

Washington University's Health Administration Program is committed to nondiscriminatory practices in selection of applicants regarding race, sex, age, religion, or national origin. The faculty and staff are affirmatively committed to recruiting, enrolling, and educating students from minority groups who have the potential for graduate study.

A minimum of a bachelor's degree from an accredited university or college acceptable to Washington University School of Medicine is required, as is completion of the Graduate Record Examination (Aptitude Test) or the Graduate Management Aptitude Test. No specific undergraduate major field of study is required for admission into the program; however, introductory courses in accounting, economics, statistics (or their equivalents), and mathematics through college algebra are very strongly recommended.

Tuition per semester	\$5,250
Books and supplies (per semester)	450
Application fee (nonrefundable)	25

"B" Electives Health Administration

As a specialty, health administration (HA) looks at medical care from an institutional and organizational perspective. Rational health administration requires expert knowledge in many areas including: law, finance, planning, and organizational behavior.

The goals of this six-week elective are:

1. An overview of the specialty of health administration.
2. Firsthand contact with selected local institutions and their administrators.
3. Investigation of particular subjects of interest.

The purpose of the elective is not to make administrators out of physicians. Rather it is anticipated at the end of the six weeks that the student will be able to communicate with those persons who see medicine from an organizational viewpoint. *Dr. Marc D. Smith*

Faculty

Professor and Director

James O. Hepner, B.A., University of Iowa, 1955; M.H.A., Washington University, 1959; Ph.D., University of Iowa, 1964.

Professor

David A. Gee, B.A., DePauw University, 1949; M.H.A., Washington University, 1951.

Associate Professor and Associate Director

Stuart B. Boxerman, B.S.E.E., Washington University, 1963; M.S.E.E., 1965; D.Sc., 1970.

Associate Professor

Robert S. Woodward B.A., Haverford College, 1965; Ph.D., Washington University, 1972.

Associate Professors (Adjunct)

Ted Bowen, B.S., Austin College, 1941; M.H.A., Washington University, 1951.

James A. Canedy, B.A., Hastings College, 1950; M.H.A., Washington University, 1952.

James D. Harvey, B.A., University of South Dakota, 1950; M.H.A., Washington University, 1952.

David H. Hitt, B.S., University of South Dakota, 1950; M.Sc., 1950; M.H.A., University of Minnesota, 1952.

Linn B. Perkins, B.A., Amherst College, 1949; M.H.A., Washington University, 1951.

Assistant Professors

Virginia L. Drone, B.A., Maryville College, 1966; M.H.A., Washington University, 1975; Ph.D., 1977.

Robert J. Hickok, B.S., Washington University, 1953; M.H.A., 1971. (See Administration and Program in Physical Therapy)

Marc D. Smith, B.S., University of Missouri, 1971; M.Div., Concordia (Seminex), 1975; Ph.D., St. Louis University, 1979.

Assistant Professors (Adjunct)

Ronald E. Gribbins, B.A., St. Norbert College, 1966; M.B.A., University of Wisconsin, 1971; Ph.D., 1975.

Frank S. Groner, A.B., Baylor University, 1934; LL.D., East Texas Baptist College, 1946.

Boone Powell, Sr., LL.D., Baylor University, 1958.

Sister Mary R. Rocklage, B.S., St. Xavier College, 1961; M.H.A., St. Louis University, 1963.

Robert F. Scates, B.A., Baylor University, 1939.

Instructors (Adjunct)

Richard M. Abell, B.A., Western Kentucky University, 1963; M.A., 1965; M.H.A., Washington University, 1972.

Merle L. Aukamp, B.A., University of Illinois, 1957; M.H.A., Washington University, 1968.

Donald H. Ayers, B.S., Muskingum College, 1962; M.H.A., George Washington University, 1965.

Ernest O. Bacon, Jr., B.A., University of Tennessee, 1960; M.H.A., Virginia Commonwealth University, 1968.

Barry T. Bedenkop, Sr., B.S., Purdue University, 1954; M.B.A.H.A., University of Chicago, 1961; J.D., University of Toledo, 1972.

David B. Blackburn, B.S., Ohio State University, 1962; M.B.A., Xavier University, 1971.

Edgar V. Borgenhammar, B.S., Stockholm School of Economics, 1962; M.B.A., University of California, Berkeley, 1964; Ph.D., 1972.

Frederick L. Brown, B.S., Northwestern University, 1962; M.H.A., George Washington University, 1966.

Richard W. Brown, B.A., Phillips University, 1968; M.H.A., Washington University, 1970.

Sister Betty Ann Brucker, B.A., St. Louis University, 1951; M.A., 1959; M.H.A., 1972.

L. Gerald Bryant, B.B.A., University of Oklahoma, 1964; M.H.A., Washington University, 1968.

Sister Dorothy Burnes, B.A., St. Xavier College, 1961; M.A., DePaul University, 1966; M.H.A., St. Louis University, 1973.

Sarah G. Burtram, B.A., Dominican College, 1970; M.H.A., Washington University, 1972.

Keith L. Callahan, B.A., Trinity College, 1974; M.B.A., Washington University, 1976; M.H.A., 1977.

John T. Carson, B.S., University of Scranton, 1963; M.H.A., Georgia State University, 1975.

John W. Carver, B.S., Trinity University, 1974; M.H.A., Washington University, 1976.

Eugene K. Cashman, Jr., B.A., Auburn University, 1964; M.A., American University, 1974.

Eric E. Chapman, B.S., Northwestern University, 1965; J.D., George Washington University, 1968; M.P.H., University of Michigan, 1977.

Jane Connorton, A.A., Marymount College, 1970; B.A., Fordham University, 1972; M.P.A., New York University Graduate School of Public Administration, 1977.

Keith W. Curtis, B.A., Colorado State College, 1960; M.B.A., Syracuse University, 1974; Ph.D., University of Oklahoma, 1973.

Jeptha W. Dalston, B.A., Texas A&M University, 1952; M.A., University of Oklahoma, 1966; M.H.A., University of Minnesota, 1969; Ph.D., University of Oklahoma, 1970.

A. B. Davis, Jr., B.A., University of Kansas, 1950.

Robert V. Deen, B.A., Texas Christian University, 1969; M.H.A., Washington University, 1974.

Eugene M. Devine, B.A., Union College, 1970; M.H.A., University of Pittsburgh, 1973.

Richard C. Ellerbrake, B.A., Elmhurst College, 1955; B.D., Eden Theological Seminary, 1958; M.H.A., Washington University, 1964.

John T. Farrell, B.A., Cardinal Glennon College, 1969; M.H.A. St. Louis University, 1973.

Thomas W. Fourqurean, B.B.A., Texas College of Arts and Industries, 1939; M.B.A., University of Chicago, 1949.

Max D. Francis, B.S., Kansas Wesleyan, 1962; M.H.A., Washington University, 1966.

Phillip H. Goodwin, B.A., Hendrix College, 1943; M.H.A., Washington University, 1968.

Robert L. Graves, B.S., Muskingum College, 1968; M.H.A., Washington University, 1975.

H. Rich Grisham, B.A., University of Oklahoma, 1968; M.H.A., Washington University, 1973.

Dennis A. Hall, B.S., University of Louisville, 1971; M.H.A., Washington University, 1973.

Thomas J. Hartford, Jr., B.A., George Washington University, 1950; M.H.A., Washington University, 1958.

Howard L. Hays, B.S., University of Omaha, 1957; M.H.A., Washington University, 1959.

M. James Henderson, B.S., Stanford University, 1967; M.H.A., Washington University, 1975.

Robert A. Hille, B.A., University of Connecticut, 1954; M.A., Baylor University, 1969.

Duane T. Houtz, B.A., University of Kansas, 1955; M.H.A., Washington University, 1960.

James B. Humphreys, B.A., Westminster College, 1963; M.H.A., Trinity University, 1969.

Charlotte Lehmann, B.S., Washington University, 1963; M.H.A., 1979.

Charles G. Lohr, B.A., Westminster College, 1950; M.H.A., Washington University, 1952.

John P. McGuire, B.S., Christian Brothers College, 1970; M.B.A., Memphis State University, 1975; M.H.A., Washington University, 1985.

Garry A. Maness, B.A., Memphis State University, 1973; M.H.A., 1977.

Larry L. Mathis, B.S., Kansas State College, 1965; M.H.A., Washington University, 1972.

Joseph J. Neidenbach, B.A., College of the Holy Cross, 1967; M.H.A., Washington University, 1974.

John F. Norwood, B.S., North Carolina State University, 1952; M.H.A., Northwestern University, 1958.

Robert J. O'Brien, B.S., Phillips University, 1960; M.H.A., Washington University, 1965.

D. Kirk Oglesby, B.A., Davidson College, 1952; Certificate in Hospital Administration, Duke University, 1954.

Gary R. Olson, B.A., Illinois State University, 1972; M.H.A., Washington University, 1976.

Jerry Paul, B.A., Elmhurst College, 1971; M.Div., Eden Theological Seminary, 1974; M.H.A., Washington University, 1983.

Max H. Poll, B.B.A., Western Michigan University, 1972; M.H.A., University of Minnesota, 1974.

Glenn E. Potter, B.A., Ottawa University, 1965; M.H.A., Washington University, 1972.

Boone Powell, Jr., B.A., Baylor, 1959; M.A., University of California, 1960.

Joseph H. Powell, B.A., University of Tennessee, 1950; M.H.A., University of Minnesota, 1955.

E. Wynn Presson, B.B.A., University of Texas, 1963; M.H.A., Washington University, 1965.

Jasper J. Purvis, B.S., University of Tennessee, 1968; M.H.A., Washington University, 1970.

J. Larry Read, B.S., Lamar University, 1968; M.H.A., Washington University, 1974.

Stephen C. Reynolds, B.S., Arkansas State University, 1968; M.H.A., Washington University, 1972.

Haynes Rice, B.S., West Virginia State College, 1953; M.H.A., University of Chicago, 1964.

Daniel F. Russell, B.S., University of Miami, 1963; M.H.A., Washington University, 1966.

Mark R. Russell, B.A., Marquette University, 1971; M.H.A., Washington University, 1973.

C. Edward Schwartz, B.A., Kentucky Wesleyan College, 1962; M.Div., Methodist Theological School in Ohio, 1965; M.H.A., Washington University, 1968.

Franklin Simek, B.S., John Carroll University, 1949; M.H.A., Washington University, 1954.

Chester L. Stocks, B.S., Alabama Polytechnic Institute, 1949; M.H.A., Washington University, 1955.

Martin J. Strussion, B.S., St. Louis University, 1969; M.H.A., Washington University, 1978.

Ponnuswamy Swamidoss, B.S., Pennsylvania State University, 1969; M.A., George Washington University, 1972; Dr.PH., Howard University, 1981.

Charles E. Thoele, B.Sc., St. Louis University, 1953; B.S., 1961; M.B.A., Southern Illinois University, 1976.

Mark A. Wallace, B.A., Oklahoma Baptist University, 1975; M.H.A., Washington University, 1978.

Robert F. Wallace, B.A., St. Leo College, 1972; M.H.A., Washington University, 1974.

Dan S. Wilford, B.A., University of Mississippi, 1962; M.H.A., Washington University, 1966.

Gordon C. Williams, B.S., Cornell University, 1952; M.H.A., University of Chicago, 1956.

Thomas C. Winston, B.A., Memphis State University, 1965; M.H.A., Washington University, 1967.

Paul R. Wozniak, B.A., St. Louis University, 1950; M.H.A., 1955.

Paul H. Wunderlich, B.A., Valparaiso University, 1962; M.H.A., Washington University, 1967.

Lecturers

Lawrence I. Kahn, A.B., University of Alabama, 1941; M.D., Louisiana State University, 1945. (See Department of Pediatrics.)

Merlin E. Lickhalter, B.A., Massachusetts Institute of Technology, 1957.

Lecturers (Adjunct)

Warren R. Betts, B.S., Virginia Commonwealth University, 1957; M.H.A., 1959.

A. R. Black, Jr., B.S., Washington University, 1964.

James C. Crews, B.S., Wisconsin State University, 1959; M.H.A., University of Iowa, 1964.

Robert E. Frank, B.S., St. Louis University, 1950; M.H.A., 1962.

Dean M. Hosmer, A.B.E., University of Michigan, 1969; M.P.H., 1980.

Ned O. Lemkemeier, B.A., Wesleyan University, 1959; LL.B., Washington University, 1962.

Carl T. Martinson, B.S., University of Kansas, 1963.

David S. Ramsey, B.A., University of Michigan, 1953; M.A., 1954; M.H.S.A., 1962.

O. Paul Reinert, B.B.A., University of Notre Dame, 1972.

Robert Rubright, B.A., Westminster College, 1954; M.A., University of Wisconsin, 1958.

Darwin W. Schlag, Jr., B.S.B.A., Washington University, 1950.

Paul J. Schroeder, Jr., A.B., University of Notre Dame, 1969; J.D., Washington University, 1972.

J. Stuart Showalter, B.A., DePauw University, 1968; J.D., Washington University, 1971; M.E.S., George Washington University, 1977.

Donald B. Wagner, B.S., College of Physicians & Surgeons, 1952; M.H.A., Baylor University, 1960.

Barbara Y. Whitman, B.S., University of Louisville, 1964; M.S.W., Washington University, 1973; Ph.D., 1980.

PROGRAM IN NURSE ANESTHESIA

The Department of Anesthesiology within the School of Medicine offers a program which prepares registered nurses for employment in the health care field of anesthesia. Graduates of the program are eligible for national certification, by examination through the Council on Certification of Nurse Anesthetists.

The Washington University Program in Nurse Anesthesia evolved from an anesthesia school established in 1929 and operated continuously for 54 years under the direction of Barnes Hospital.

The CRNA is a registered nurse whose advanced training enables her/him to provide a specialized nursing service. Participating as a member of the anesthesia care team, the nurse anesthetist renders anesthesia care in its entirety to surgical patients.

The curriculum covers a 24-month period, divided between didactics and clinical practicum. Educational experience is obtained at the Barnes Hospital facilities under the direction of anesthesiologists, certified registered nurse anesthetists, and allied health specialists.

Graduates of the program have access to career opportunities throughout the United States. Applicant's credentials must include:

- a. Current licensure as a registered nurse.
- b. One year's experience in a critical care setting.
- c. A Bachelor of Science Degree in Nursing, *or* a Bachelor's Degree which includes three humanities courses (sociology or psychology); two communications courses (English, speech, or foreign language) and five biophysical science courses (minimum 18 hours).

The program is accredited by the Council on Accreditation of Nurse Anesthesia Educational Programs/Schools and complies with its standards and guidelines.

Program specifics may be obtained from Department of Anesthesiology, Nurse Anesthesia Program, Washington University School of Medicine, Campus Box 8054, 660 South Euclid Avenue, St. Louis, Missouri 63110.

Professor and Head of Department of Anesthesiology

William D. Owens, B.A., Westminster College, 1961; M.D., University of Michigan, 1965.

Program Director

LaVerne J. Will, R.N./A.D., Belleville Community College, 1968; C.R.N.A., Barnes Hospital School of Nurse Anesthesia, 1970; B.A., Stephens College, 1978; M.S., Southern Illinois University-Edwardsville, 1980.

Chief Nurse Anesthetist

Robert E. Ayers, R.T., St. John's School of Radiologic Technology, 1956; R.N., Methodist Hospital, 1961; C.R.N.A., Barnes Hospital School of Nurse Anesthesia, 1968; B.A., Stephens College, 1977.

Educational Director

Beverly A. Krause, R.N., St. Luke's Hospital School of Nursing, 1961; C.R.N.A., Barnes Hospital School of Nurse Anesthesia, 1975; B.A., Stephens College, 1977; M.S., Lindenwood College, 1982.



PROGRAM IN OCCUPATIONAL THERAPY

The Program in Occupational Therapy prepares students to practice occupational therapy, which is a clinical profession—that is, an applied science. The occupational therapist's role is the assessment, training, and facilitation of individuals in skills that will allow the individuals to carry out daily activities that are of value to them. These skills would be in the areas of self-care, vocation, and avocations, and they frequently involve skills with relationships with people. The occupational therapist is skilled in assessment and remediation techniques for impairments caused by physical or mental dysfunction. Occupational therapy utilizes activities to increase functional performance. Adaptive equipment is prescribed and sometimes fabricated by the occupational therapist.

Undergraduate Program

The curriculum consists of the junior and senior years of a four-year baccalaureate degree program. Applicants for transfer must present a minimum of 60 semester hours (including required prerequisites) from an accredited college or university. In addition, students may enter after three years in a participating college or university and complete the program with two baccalaureate degrees. Three-Two arrangements must be made in advance with selected colleges and universities.

Upon completion of four academic semesters at the School of Medicine, the degree of Bachelor of Science in Occupational Therapy is conferred. Six months of supervised clinical internship is required following graduation.

Graduate Program

The curriculum consists of five semesters that are within two academic years and the intervening summer. The student must complete a teaching and research practicum during the five-semester program. Applicants for admission must hold a bachelor's degree or be an approved participant in a Three-Two program, and have prerequisites from an accredited college or university.

Upon completion of the five semesters including practica at the School of Medicine, the degree of Master of Science in Occupational Therapy is conferred. Six months of supervised clinical internship is required following graduation.

Tuition (undergraduate and graduate), per semester	\$5,000
Fee, Clinical Internship	700
Fee, Practica	1,000

For further information, contact the Program in Occupational Therapy, 4567 Scott Avenue, St. Louis, Missouri 63110.

Phone: (314) 362-6911.



Faculty

Assistant Professor and Acting Director

Ellen T. Tyson, B.S., Syracuse University, 1949; M.A., 1950; Cert. in O.T., University of Pennsylvania, 1952.

Associate Professor Emeritus

Martha E. Matthew, A.B., Winthrop College, 1933; Cert. in O.T., College of William and Mary, 1947.

Assistant Professors Emeriti

Garth D. Tubbs, B.S., Wisconsin State College, 1953; Cert. in O.T., Washington University, 1955.

Elizabeth H. Withers, B.S., Memphis State University, 1957; M.A., 1959; Cert. in O.T., Philadelphia School of O.T., 1941.

Associate Professor

C. Robert Almli, B.S., Michigan State University, 1966; M.A., 1968; Ph.D., 1970.

Assistant Professor

M. Carolyn Baum, B.S., University of Kansas, 1966; M.A., Webster College, 1979.

Instructors

Joel Achtenberg, B.A., Washington University, 1968.

Harriet A. Backhaus, B.A., Harris Teachers College, 1971; COTA, Westminster College, 1976.

Susan Buerkle, B.S.O.T., Washington University, 1980.

Dorothy Edwards, B.A., Loyola University, 1972; Ph.D., Washington University, 1980.

Jeffrey S. Engh, A.S., St. Louis Community College-Meramec, 1985; A.A.S., 1984.

Christine Feely, B.A., University of South Carolina, 1975; Ph.D., Washington University, 1984.

Susan M. Kusama, B.S.O.T., Washington University, 1965; M.S., 1978.

Patricia D. LaVesser, B.S., University of Wisconsin, 1974.

Aimee Luebben, B.A., Illinois University, 1975; B.S., Washington University, 1984; M.S., 1985.

Margaret Rich, B.S., Northwestern University, 1974; M.D., 1976; Ph.D., 1977.

Berton Singerman, M.D., Harvard University, 1973; M.P.H., Johns Hopkins University, 1975.

Deborah L. Stengel, B.S., University of Wisconsin, 1970.

Instructors (Clinical)

Mercedes Abella

Charletta Adams

Nancy Allen

Norma Arras

Janice Bacon

Anita Baker

Paula Terry Berg

Jeanenne Blaha

Lauri Bowles

Kim Boylan

Mary Beth Brekrus

Colleen Brewer

Luann Brown

Mary Jay Bullock

Cheryl Burton

Margaret Cochran

Al Copolillo

Monina Copuaco

Jeff Cowdry

Susan Cunningham

Sue Divine

Judy Doerr

Mary Donohue

Julie Ellis

Leigh Enge

Mary Falcetti

Susan Fine

Kim Frank

Maureen Freda

William C. Gielow

Bette Ann Gilbert

Dorothea Gilbert

Debbie Grillion

Ola Glasgow

Karen Grace
LaVerne Grady
Mary Therese Hawley
Marjorie E. Hill
Michelle Isserman
Cindy Kempf
Mary Lou Kieshauer
Jeanne Kloeckner
Carol Knopp
Lisa Kohner
Sharon Kreh
James Landolt
Ann Lindberg
Mary Ann McKay
Susan McLaughlin
Patricia Melechen
Joan Merlo
Karen Miller
Kathleen Mital
Katie Mitchell
Karen Mullaney
Mary Murphy
Keri Nagib
Kathleen Okkema
Elfrieda Olney
Dottie Pennington
Mary Grace Phelan
Joanne Phillips
Daphne Piegrome
Sue Poncirolli
Julie Proctor
Margaret Russell
Letty Sargent
Sue Schroeder
Debby Seyer
Sophia Shuter
Clarence Sicard
Sarah Skinner
Dixie Sleight
Trudy Smith
Peggy Soebel
Barbara Sopp
Monica Stuesse
Elizabeth Sullivan
Mary Sullivan
Ann Swanborg
Julia Sweeney
Barbara Townsend
Phyllis Trahey
Karen Wagner
O. Gayle Wagner
Julie Walker
Pam Walters
Mary Warren
Judy Westhoff
Laura White
Terrie Winslow
Francine Woods
Pat Zielinski

PROGRAM IN PHYSICAL THERAPY

The program of instruction leading to the degree of Master of Science in Physical Therapy is an intensive two and one-half year curriculum offered at the School of Medicine. Applicants for admission must have completed either a baccalaureate degree at an accredited college or university or be eligible to participate in a combined degree program. Requirements are specific courses in English, psychology, biology, physics, chemistry, mathematics, and social sciences.

Kinesiology and pathokinesiology form the core of the curriculum. The study of kinesiology/pathokinesiology requires application of physical, biological, and applied science principles to normal and abnormal human movement. The basic and clinical sciences provide the foundation upon which the physical therapist can develop and apply scientific principles to patient care. The goal of the curriculum is to produce

practitioners who can competently utilize the scientific approach to assess, remediate, and prevent pathokinesiological disorders.

The program provides an environment in which students are guided to acquire the requisite body of knowledge for the current and future practice of physical therapy. The faculty strives to bring scholarly knowledge to bear on the problems of the profession through research and clinical practice. Outstanding role models in the clinical and academic faculty encourage students to achieve their highest personal and professional potential.

Tuition per semester \$4,650

Clinical Education Fee \$ 300

Further information may be secured by direct correspondence with the Program in Physical Therapy, Campus Box 8083, 660 South Euclid Avenue, St. Louis, Missouri 63110.



Faculty

Associate Professor and Director

Steven J. Rose, B.S., Ithaca College, 1962; Ph.D., Albert Einstein College of Medicine, 1977.

Associate Professor Emeritus

Beatrice F. Schulz, B.S., Washington University, 1949; M.A., 1955.

Assistant Professor Emeritus

Lorraine F. Lake, B.S., Washington University, 1950; M.A., 1954; Ph.D., 1962.

Associate Professor

Shirley A. Sahrmann, B.S., Washington University, 1958; M.A., 1971; Ph.D., 1973. (See Departments of Neurology and Neurological Surgery and Cell Biology and Physiology.)

Visiting Associate Professor

Eugene Michels, B.S., University of Cincinnati, 1950; Certificate in P.T., University of Pennsylvania, 1951; M.A., University of Pennsylvania, 1967.

Assistant Professor

Robert J. Hickok, B.S., Washington University, 1953; M.H.A., 1971. (See Administration and Health Administration Program.)

Instructors

Gail W. Baudendistel, B.S., St. Louis University, 1974; M.S., 1977.

Marybeth Brown, B.S., Russell Sage College, 1967; M.S., University of Southern California, 1974; Ph.D., 1984.

Gail P. Dalsky, B.S., Wisconsin State University, 1971; M.A., Ball State University, 1977; Ph.D., Brigham Young University, 1982.

Anthony Delitto, B.S., State University of New York at Buffalo, 1979; M.H.S./PT., Washington University, 1983.

Ronna S. Delitto, B.S., State University of New York at Buffalo, 1979; M.H.S./PT., Washington University, 1985.

Robert H. Deusinger, B.S., Slippery Rock State College, 1967; M.S., University of Massachusetts, 1968; Ph.D., The University of Iowa, 1981.

Susan S. Deusinger, B.S., University of Kansas, 1968; M.A., Washington University, 1980; Ph.D., 1987.

Kathleen Dixon, B.S., University of Maryland, 1955; Certificate in Physical Therapy, Medical College of Virginia, 1955; M.Ed., Johns Hopkins University, 1969.

John Dueker, B.S./PT., St. Louis University, 1978; M.H.S./PT., Washington University, 1985.

Peter T. Fox, B.A., St. Johns College, 1975; M.D., Georgetown University, 1979.

Joseph A. Holden, B.S., Rutgers University, 1971; Ph.D., Duke University, 1975; M.D., University of Michigan, 1982.

John W. Kneesevich, A.B., Indiana University, 1971; M.D., C.M., McGill University, 1974.

Fallon Maylack, B.A., Johns Hopkins, 1977; M.P.H., 1978; M.D., Washington University, 1981.

Mary Kate McDonnell, B.S./PT., St. Louis University, 1981; M.H.S./PT., Washington University, 1985.

Michael Mueller, B.S., Washington University, 1979; M.H.S./PT., 1985.

Barbara J. Norton, B.S., Washington University, 1966; M.H.S./PT., 1984.

Kathryn E. Roach, B.A., Indiana University, 1972; B.S./PT., University of Illinois, 1974; M.H.S./PT., Washington University, 1985.

Richard Roettger, B.S., Washington University, 1962.

Jennifer S. Stith, B.S., University of California-Davis, 1976; M.S., University of Southern California, 1978.

Janet A. Tenhula, B.S., University of Wisconsin, 1964; M.H.S./PT., Washington University, 1986.

Linda Van Dillen, B.S., University of Missouri-Columbia, 1979; M.H.S./PT., Washington University, 1985.

Douglas Young, B.A., St. Olaf College, 1977; Ph.D., Washington University, 1983.

Lecturers

Jennifer Barbee, B.S., University of Oklahoma, 1982.

Gene R. Brown, B.S., University of Iowa, 1971; M.A., 1975.

Suzanne M. Cornbleet, B.S., University of Colorado, 1975.

Jack Gamet, B.S., University of Oregon, 1952.

Linda Guth Stangl, B.S., St. Louis University, 1978.

Kathleen M. Haralson, B.S., University of Kansas, 1965.

Patricia Kohne, B.S., Washington University, 1985.

Marc Reisman, B.A., University of the Pacific, 1968; M.S., Boston University, 1983.

Vickie J. Robinson, B.S., University of Oklahoma, 1981.

Vivian L. Smith, B.S., State University of New York, 1979; B.S./PT., New York University, 1980.

Instructors (Clinical)

Alena Allen

Steve Allen

Jim Alviti

Robert L. Ashley

Michele Audet

Greg Bachman

Brian Badders

Debbie Baldwin

Susan Barr

Jackie Bender

Kerstin Benya

Debbie Biver

Diane Borello

Dave Bortfeld

Tammy Brooks

Caryl Bryan

Susan Cannon

Shirley Carlson

Virginia Carlson

Cindy Carsten

Larry Chojeci

Paul Christiansen

Barbara Christie

Mary Pat Corrigan

Susan Courque

Jackie Crossen-Sills

Pam Dehne

Steven Dickoff

Ann E. Dinsmore

Joe Durham

Kathy Early

Mary Erhart

Becky Farley

Patty Finnegan

Karinne Fish

Alice Flaherty
 Jean Fleming
 Leonard Framson
 Sue Graber
 Marlene Gravat
 Jenny Gregory
 Bernie Gruzka
 Linda Haar
 Iola Haddock
 Mary Hall
 Theresa Hall
 Cynthia Hanley
 Donabelle Hansen
 Lyn Hardage
 Sandy Hartner
 Judy Heckman
 Tim Heckmann
 Gail Huber
 Rick Huelsing
 Ed Jacquin
 Bonnie Johnson
 JoAnn Jones
 Jeesica Justino
 Dan Kelley
 Melanie Kozelicki
 Ed Koziatsek
 Marni Kretschmar
 Mary Kruchowsky
 Carla Kurth
 Eric Kuschel
 Ann LaBonte
 Karen LaFreniere
 Nick Laubenthal
 Mary Liedloff
 Judy Ligman
 Jane Lockett
 Remo Lucci
 Marsha Mahne

Ann Marcolina
 Nancy Mechesney
 Shirley Meissner
 Kathy Mercuris
 Vonnie Messman
 Janet Miles
 Mike Miller
 Sheri Miller
 Tom Miller
 Joan Mills
 Harriette Mueller
 Nora Munagian
 Brenda Nicolai
 Mary Niemeyer
 Martha Nixon
 Jan Nolte
 Norma Olish
 Margie O'Shaughnessy
 JoAnn Parisi
 Cinny Parrish
 Camille Pepe
 Pamela P. Perkins
 Beth Phillippi
 Kathleen Plunkett
 Michael Pohlman
 Sandra Pomeroy
 Nancy Potter
 Tammy Pudwill
 Joan Puglisi
 Mary Raab
 Chris Renaud
 Jackie Rinaldo
 Donna Roettger
 Erica Rouvalis
 Phyllis Rowland
 George Rowley
 Marilyn Rubin

Mary Rudd
 Rick Saia
 Jill Sawyer
 Catherine Schmidt
 Peg Schultz
 Gale Scott
 Sandy Shade
 Mikel Shelton
 Melissa Shepard
 Ann Short
 Barbara Skinner
 Beth Slama
 Vivian Smith
 Janic Stanislaw
 Cheryl Stevens
 Pamela Stockman
 Michael R. Swedenburg
 Marcia Taeger
 Karen Tarbuck-Nelson
 Janet Tenhula
 Ann Thomas
 Charlie Thompson
 Cathy Thut
 Jeanne Tribou
 Mike Tuckey
 Gary Vandekamp
 Jeff Verhoef
 Michael Voight
 Margaret Waite
 John Ward
 Nancy Wedman
 Eric Weiskopf
 Judy Woehrl
 Barbara Woodall
 Margie Yanko
 Bonnie Yost
 Lynn Zoellner

Miscellaneous

On January 7, 1987, the Executive Faculty acted to discontinue the Department of Preventive Medicine and Public Health. Programs and Faculty of the department are listed separately or have been assigned to other departments.

Professors Emeriti of Preventive Medicine and Public Health

C. Howe Eller (Public Health), A.B., Stanford University, 1927; M.D., University of Colorado, 1930; Ph.D., Johns Hopkins University, 1934.

Robert E. Shank, A.B., Westminster College, 1935; M.D., Washington University, 1939. (See Department of Medicine.)

Danforth Professor of Preventive Medicine and Public Health

M. Kenton King, B.A., University of Oklahoma, 1947; M.D., Vanderbilt University, 1951. (See Administration and Department of Medicine.)

PROGRAMS IN RADIOLOGIC TECHNOLOGY

The Department of Radiology, which has its headquarters in the Edward Mallinckrodt Institute of Radiology, offers a basic 24-month course in X-ray technology, and a 12-month postgraduate course in Radiation Therapy technology.

X-ray Technology

This two-year program is approved by the American Society of Radiologic Technologists, the American College of Radiology, the Joint Review Committee on Education in Radiologic Technology, the Council on Medical Education of the American Medical Association, and the Veterans Administration. It includes the following courses: radiation protection, professional ethics, anatomy and physiology, nursing procedures, radiation physics, medical terminology, survey of medical and surgical diseases, radiographic positioning, darkroom processing procedures, radiation therapy, radiation biology, nuclear medicine, special procedure radiography, pediatric radiography and general courses in radiographic positioning. Course work totals approximately 760 hours.

The first six months of student training is considered a probationary period during which students will be evaluated carefully to determine their suitability for the program. Upon satisfactory completion of this probationary period, the students will begin to receive a monthly stipend of \$75 which shall continue for the next six months of training. As the student moves into the third six-month period, the stipend amount increases to \$100 per month, and rises, finally, to \$125 per month for the last six months of training.

Candidates for admission must be at least 18 years of age and present evidence of successful completion of four years of education in an accredited high school, or equivalency. Special consideration will be given to applicants who have passed college entrance examinations and to those who have earned college credits, especially in courses such as science, algebra, chemistry, and physics.

Graduate Course in Radiation Therapy Technology

The Division of Radiation Oncology offers a 12-month postgraduate course in radiation therapy technology. The course of training consists of didactic material and extensive practical experience and training in the clinical application and dosimetry procedures of radiation therapy. Approximately 1,600 new patients are treated each year. Therapy equipment available on-site includes four linear accelerators (4 MEV, 6 MEV, 20 MEV, 18/100 MEV), a cobalt unit, a superficial orthovoltage machine, a hyperthermia suite, and three treatment planning simulators. Students obtain experience on each of the on-site therapy machines and in the affiliate training centers, as well as in the dosimetry and treatment planning area and in nursing procedures. On-site computers are used for dosimetry and treatment planning computations. The students rotate through the physics and treatment planning service in addition to attending practical demonstrations.

Director of Technical Education

Michael D. Ward, R.T., M.Ed.,
University of Missouri-St. Louis,
1987. (See Department of
Radiology.)



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*Assistant Vice Chancellor for
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*Assistant Dean for Minority
Student Affairs*

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M.S., Ed.S., Ph.D.
*Assistant Dean in Academic
Administration, Registrar, and
Secretary to the Executive Faculty*

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Assistant Dean

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*Assistant Vice Chancellor for
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Assistant Dean

John F. Walters, B.A., M.A.
*Assistant Dean for
Student Affairs, Director of
Student Financial Aid*

Eugene Mueth, B.S.-C.
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Susan Y. Crawford, M.A., B.A.,
B.L., Ph.D.

*Director of Library
School of Medicine*

Mary L. Parker, B.S., M.S., M.D.
*Director of University
Health Services*

Muriel L. Koch
*Senior Administrative Assistant
to the Dean*

Dorothy T. Rinderer
*Senior Administrative Assistant to
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Jean Stumbaugh, B.S., B.A.
*Assistant Registrar in Academic
Records and Registration*



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*Clinical Representative to the
Executive Committee of the
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*Clinical Representative to the
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*Preclinical Representative to the
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*Preclinical Representative to the
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Morton E. Smith
*Clinical Representative
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*Preclinical Representative
to the Executive Faculty*

Peter G. Tuteur
*Representative to the Senate
Council of Washington
University*

¹Representing the Faculty Council during 1987-88.

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ex officio
John L. Schultz
ex officio

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DOCTOR OF MEDICINE AND DOCTOR OF PHILOSOPHY DEGREES

Medical Scientist Training Program

Graduating Class— May 15, 1987

Barr, Frederic Glenn
Baltimore, MD
B.A., Williams College, '80
Pathology
Hospital of the University of Pennsylvania, Philadelphia, PA

Baum, Charles Michael
Denver, CO
B.A., University of Colorado, Boulder, '80
Pathology
Stanford University Hospital, Stanford, CA

Boguski, Mark Stanley
Philadelphia, PA
B.A., Johns Hopkins University, '76
Pathology
Barnes Hospital, St. Louis, MO

Green, Eric Douglas
Frontenac, MO
B.S., University of Wisconsin, '81
Pathology
Barnes Hospital, St. Louis, MO

Lukacher, Aron Eliot
Rochester, NY
A.B., Brandeis University, '80
Pathology
Brigham and Womens Hospital, Boston, MA

MacArthur, Craig Alan
Berkeley, CA
B.S., University of California, Berkeley, '81
Pediatrics
Children's Hospital, Los Angeles, CA

Martin, Paul Langlie
Britain, CT
A.B., Harvard University, '79
Pediatrics
Yale-New Haven Hospital, New Haven, CT

Simmons, Barbara Marie
Alexandria, VA
B.A., Johns Hopkins University, '80
Internal Medicine Preliminary
St. Mary's Health Center, St. Louis, MO
Anesthesiology
Massachusetts General Hospital, Boston, MA

Smith, Roderic Lee
Port Isabel, TX
B.A., Harvard University, '80
Pediatrics
University of Colorado School of Medicine, Denver, CO

Eighth-Year Trainee 1986-87

Hollifield, Willaim Claude, Jr.
Sacramento, CA
B.S., University of California, Berkeley, '74; M.A., '78

Seventh-Year Trainee 1986-87

Arkin, Martin Samuel
Novi, MI
B.S., University of Michigan, Ann Arbor, '80

Sixth-Year Trainees 1986-87

Behlke, Mark Aaron
El Paso, TX
B.S., Massachusetts Institute of Technology, '81

Chou, Hubert Shin-Han
Santa Ana, CA
B.S., University of California, Irvine, '81

Corless, Christopher Lee
Orinda, CA
B.A., University of California, Berkeley, '81

Faust, Phyllis Lynn
Locust Valley, NY
B.A., State University College at Potsdam, '80; B.S., Clarkson College of Technology, '81

Grant, Paula M.
Stratford, CT
B.S., M.S., Catholic University, '81

Henkel, Timothy John
Lawrenceburg, TN
B.S., Southwestern at Memphis, '81

Hing, Andrew William
San Jose, CA
B.A., Duke University, '81

Kane, Steven A.
University Heights, OH
B.S., Miami University, '81

Mink, Jonathan Walter
St. Paul, MN
B.A., Wesleyan University, '80

Selleck, Scott Brian
Seattle, WA
B.A., University of Washington, '79

Taniuchi, Megumi
Bethesda, MD
B.S., M.S., Yale University, '81

Tripp, Catherine Susan
St. Louis, MO
B.A., University of New Hampshire, '78

Fifth-Year Trainees 1986-87

Apkon, Michael
Framingham, MA
B.S., Northwestern University, '82

Auchus, Richard Joseph
Totowa, NJ
S.B., Massachusetts Institute of Technology, '82

Axelrod, Jeffrey David
Rochester, NY
Sc.B., Brown University, '81

Chu, Tommy Wah
Danville, IL
B.S., University of Illinois, '82

Crowder, Charles Michael
Camden, AR
B.A., Hendrix College, '82

Dieckgrafe, Brian Keith
St. Louis, MO
B.A., Kansas University, '82

Duncan, James Richard
Hinckley, OH
B.S., University of Michigan, '82

Kucik, Dennis Frank
Madison, WI
B.S., University of Wisconsin, '82

Loftus, David John
Palo Alto, CA
B.A., Pomona College, '81

MacDonald, Margaret Russell
Corvallis, OR
B.A., Oregon State University, '79

Masakowski, Victoria Rose
Garrett Park, MD
B.S., Washington University, '82

Porter, Forbes Dennison
Worthington, OH
B.A., Washington University, '82

Quade, Bradley Joseph
New Hope, MN
B.A., MacAlester College, '82

Scott, Leland James
Red Bluff, CA
B.S., Stanford University, '82

Silverman, Neil Jerome
Los Angeles, CA
B.S., University of California, Los Angeles, '82

Standaert, David George
Bethesda, MD
B.A., Harvard University, '82

Sweetser, David Alan
Fairfield, CA
B.S., M.S., Stanford University, '82

Tong, Patrick Yat-Fu
Fremont, CA
B.S., Massachusetts Institute of Technology, '82

Fourth-Year Trainees 1986-87

Chesis, Paul Lee
Tarzana, CA
B.A., University of California,
Berkeley, '83

Dean, Andy Chen
Elmhurst, NY
A.B., Harvard College, '83

Diaz, Ruben
Chattanooga, TN
B.S., Duke University, '83

Fine, Steven Mark
Rochester, NY
B.A., Wesleyan University, '83

Folz, Rodney Joseph
Evansville, IN
B.S., Indiana University, '83

Fuhlbrigge, Robert Conrad
Toledo, OH
B.S., University of Wisconsin, '82

Heuckeroth, Robert Otto
Silver Spring, MD
B.S., University of Maryland, '83

Inhorn, Roger Charles
Madison, WI
B.S., University of Wisconsin, '83

Li, Dean
Chicago, IL
B.A., University of Chicago, '83

Matzuk, Martin Matthew
Colonia, NJ
B.A., University of Chicago, '82

Rich, Mark Monroe
Bluffton, OH
B.A., Bethel College, '83

Silverman, Edwin Kepner
Altoona, PA
A.B., Washington University, '83

Sweetser, Marianne Tryphonas
Sunnyvale, CA
B.S., M.S., Stanford University,
'83

Towler, Dwight Arnold
Langdon, ND
B.A., Moorhead State
University, '83

Third-Year Trainees 1986-87

Carnes, Kenneth Michael
North Hollywood, CA
B.S., Brown University, '84

Cookson, Brad T.
Ogden, UT
B.S., University of Utah, '83

Green, Rebecca Paula
Davenport, IA
B.S., University of Iowa, '83

Hillier, David Alfred
Stanford, CA
B.A., B.S., Swarthmore
College, '84

Lorenz, Robinna Gail
Okeene, OK
B.S., Stanford University, '84

Roberts, Charlotte Justine
Clemson, SC
B.A., Agnes Scott College, '84

Schwab, William S., III
New York, NY
B.F.A., School of Visual
Arts, '78

Segal, Yoav
Tinton Falls, NJ
B.S.E., Princeton University, '84

Sha, William Chih-Ping
Oakbrook, IL
B.S., University of Chicago, '83

Smith, Cynthia Mae
Boston, MA
B.S., M.S., Stanford
University, '84

Solomon, Joel Stuart
Shaker Heights, OH
B.A., Johns Hopkins
University, '84

Thio, Kwee Liu Lin
Marietta, GA
Sc.B., Brown University, '84

Wagman, Iris Leslie
Raleigh, NC
A.B., Duke University, '84

Weiner, Scott Jeffrey
Lafayette Hill, PA
A.B., Harvard College, '84

Zupan, Andrew A.
Columbus, OH
B.A., Washington University, '84

Second-Year Trainees 1986-87

Baker, Keith Harold
Tequesta, FL
B.S., M.S., Emory University, '85

Baranski, Thomas John
Menomonee Falls, WI
B.S., University of Wisconsin, '85

Butman, John Anthony
Pasadena, CA
B.S., California Institute of
Technology, '85

Desai, Sanjay Arvind
Greenwood, SC
B.S.E., Duke University, '85

DiGiuseppe, Joseph Arthur
Springfield, PA
B.S., St. Joseph's University, '85

Fabrick, Kurt Charles
Barrington, IL
B.A., Washington University, '85

Hazen, Stanley Leon
Cincinnati, OH
B.A., Washington University, '85

Hershey, Andrew Dean
Newton, IA
B.S., University of Iowa, '85

Holland, Katherine Dana
Pittsburgh, PA
B.S., University of Texas, '85

Hughes, Jonathan Howard
Marshalltown, IA
B.A., Grinnell College, '85

Khurana, Gurjit Kaur
Iowa City, IA
B.S., University of Iowa, '85

Martin, David Patrick
Kokomo, IN
B.S., Indiana University, '85

Skelton, Timothy Patrick
Manitowoc, WI
B.S., Massachusetts Institute of
Technology, '85

Watson, Mark Allan
Berkeley Heights, NJ
B.A., University of
Pennsylvania, '85

Weiner, Andrew Louis
Atlanta, GA
B.S., Brown University, '85

Zempel, John Martin
Elkhorn, WI
B.S., University of Wisconsin, '85

First-Year Trainees 1986-87

Cantor, Alan Bruce
East Northport, NY
B.A., Cornell University, '85

Derechin, Viviana Maia
Chicago, IL
B.S., M.S., University of
Chicago, '86

Glaser, Paul Edward
Euclid, OH
B.S., M.S., University of
Chicago, '86

Goodkin, Howard Parker
Sierra Madre, CA
B.S.E., University of
Pennsylvania, '85

Kolodney, Michael Spencer
Fair Lawn, NJ
S.B., Massachusetts Institute of
Technology, '86

Matheny, Cali Christine
Portales, NM
B.S., Eastern New Mexico
University, '86

Moon, Anne Marguerite
Nevada, IA
B.S., University of Iowa, '84

Pressel, David Michael
Stamford, CT
B.S., Johns Hopkins
University, '86

Ross, Theodora Suzanne
Kalamazoo, MI
B.A., Kalamazoo College, '85

Schlaggar, Bradley Lorin
Wilmette, IL
Sc.B., Brown University, '86

Simon, David Keith
Evanston, IL
B.A., Johns Hopkins University '86

Strauss, Brian Louis
Millville, NJ
B.S., Massachusetts Institute of Technology, '86

Westervelt, Peter
Waterville, ME
B.A., Colby College, '85

Young, Robert Lindsay
San Jose, CA
B.S., A.B., Stanford University, '86

**DOCTOR OF MEDICINE AND
MASTER OF ARTS DEGREES
*Graduating Class—
May 15, 1987***

Becker, William Lessing
St. Louis, MO
B.A., Earlham College, '82
Transitional
St. John's Mercy Medical Center,
St. Louis, MO
Ophthalmology
Barnes Hospital, St. Louis, MO

Demmer, Laurie Ann
Concord, MA
A.B., Dartmouth College, '82
Pediatrics
Children's Hospital at Washington
University, St. Louis, MO

Griffin, Anthony Charles
Kenosha, WI
A.B., Brown University, '82
Surgery
Barnes Hospital, St. Louis, MO

Monafo, William Joseph
St. Louis, MO
B.A., Dartmouth College, '82
Pediatrics
Children's Hospital at Washington
University, St. Louis, MO

Sikich, Linmarie
Potosi, MO
B.A., Washington University, '81
Fellowship in Psychiatry
Barnes Hospital, St. Louis, MO

Starren, Justin Bruce
San Diego, CA
A.B., Washington University, '80
Internal Medicine Preliminary
U.C.L.A. San Fernando Valley
VA. Medical Center,
Sepulveda, CA
Diagnostic Radiology
Presbyterian Hospital,
New York, NY

Trainees 1986-87

Grady, Ronald Mark
St. Louis, MO
B.A., Princeton University, '84

Holland, John Michael
Portland, OR
B.A., Carroll College, '84

Knutzen, Kathryn Lee
Trabuco Canyon, CA
B.S., University of Virginia, '79

Wong, Edward Chun Cheung
Honolulu, HI
B.S., University of California,
Davis, '84

Woods, Bryan Eugene
Palo Alto, CA
B.A., University of California,
Santa Barbara, '84

**DOCTOR OF MEDICINE
DEGREE
*Graduating Class—
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Aronson, William Jacob
Milwaukee, WI
B.S., University of Wisconsin,
Madison, '83
Urology
University of California, Los
Angeles Medical Center, Los
Angeles, CA

Bade, Priscilla Faith
Mankato, MN
B.S., Washington University, '83
Internal Medicine
Hennepin County Medical Center,
Minneapolis, MN

Baird, John Bradley
Fiora, IL
A.B., Washington University, '83
Internal Medicine
Jewish Hospital at Washington
University, St. Louis, MO

Ball, Daniel Webster
Chicago, IL
B.A., Wesleyan University, '83
Internal Medicine
Baylor College of Medicine,
Houston, TX

Barth, Gregory Louis
Granite City, IL
B.S., University of Notre
Dame, '83
General Surgery
E.N.T.
University of Cincinnati,
Cincinnati, OH

Baumann, Dirk Stephen
Pittsburgh, PA
B.S., Rice University, '83
Surgery
Barnes Hospital, St. Louis, MO

Bennie, Jeffrey Barker
Monroe, OH
B.S., David Lipscomb College, '83
Internal Medicine Preliminary
St. Mary's Health Center,
St. Louis, MO
Anesthesiology
Barnes Hospital, St. Louis, MO

Bickler-Bluth, Michelle Ellen
Oceanside, NY
B.S., State University of New
York, Buffalo, '71; M.S.,
University of Wisconsin,
Madison, '79
Research in Ophthalmology
Barnes Hospital, St. Louis, MO

Bierut, Laura Jean
Arlington Heights, IL
B.A., Harvard University, '82
Psychiatry
Barnes Hospital, St. Louis, MO

Birkenmeier, Gail Louise
St. Louis, MO
B.A., Washington University, '83
Internal Medicine
Jewish Hospital at Washington
University, St. Louis, MO

Bowen, Elton Cornelius, Jr.
Decatur, GA
B.A., Emory University, '83
Obstetrics and Gynecology
Portsmouth Naval Hospital
Portsmouth, VA

Bredt, Robert Jay
Northridge, CA
B.A., Pomona College, '83
Internal Medicine
Bexar County Hospital, San
Antonio, TX

Brooks, Charles A.
St. Louis, MO
B.A., Washington University, '81
Therapeutic Radiology
Duke University Medical Center,
Durham, NC

Brundidge, Phyllis Kaye
Lakeland, FL
B.A., Emory University, '83
Internal Medicine Preliminary
St. Mary's Health Center,
St. Louis, MO
Anesthesiology
Barnes Hospital, St. Louis, MO

Burklow, Thomas Ray
Evansville, IN
A.B., Washington University, '83
Pediatrics
Walter Reed Medical Center,
Washington, DC

Burri, Robert Alan
Berkeley, CA
B.S., California State University,
Long Beach, '82
Transitional
Highland General Hospital,
Oakland, CA

Buzneco, Carlos
Miami, FL
A.B., Washington University, '82
Internal Medicine Preliminary
Mt. Sinai Medical Center,
Miami, FL
Ophthalmology
University of Miami, Miami, FL

Chiao, Gene Zin-Nan
Walnut Creek, CA
B.S., University of California,
Berkeley, '83
Internal Medicine
University Health Center,
Montefiore Hospital,
Pittsburgh, PA

Churchwell, Keith Burnell
Nashville, TN
B.S., Harvard University, '83
Internal Medicine
Emory University School of
Medicine, Atlanta, GA

Countiss, John Spencer
Columbus, OH
A.B., Washington University, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Cragle, Stephen Paul
Hudson, IA
B.A., Bethel College, '83
Surgery Preliminary
Jewish Hospital at Washington
University, St. Louis, MO
E.N.T.
University of Wisconsin,
Madison, WI

Curran, Steven Alan
Omaha, NE
B.A., University of Nebraska,
Omaha, '83
Family Practice
San Pedro Peninsula Hospital,
San Pedro, CA

Daniels, Brian Fredrick
San Francisco, CA
B.S., M.S., Massachusetts
Institute of Technology, '81
Internal Medicine
The New York Hospital
New York, NY

Dodson, Brian Daniel
Homewood, IL
B.S., Wheaton College, '82
Internal Medicine
University of Iowa Hospitals and
Clinics, Iowa City, IA

Donovan, John Stephen
Stanford, CA
B.S., Stanford University, '82
E.N.T.
University of Oklahoma College
of Medicine, Oklahoma City, OK

Drlik, Jan
Santa Cruz, CA
B.A., University of California,
Santa Cruz, '83
Emergency Medicine
St. Vincent's Medical Center,
Toledo Hospital, Toledo, OH

Feldman, Jeffrey Stuart
Spring Valley, NY
B.S., Haverford College, '83
Pediatrics
Children's Hospital at Washington
University, St. Louis, MO

Forstot, Robert Marc
New Milford, NJ
B.A., Williams College, '83
Surgery
Barnes Hospital, St. Louis, MO

Frank, Edward William
San Rafael, CA
B.S., Stanford University, '83
Internal Medicine
University of Washington
Affiliated Hospitals, Seattle, WA

Friedman, Deborah Louise
St. Louis, MO
B.A., Vanderbilt University, '80
Transitional
Tucson Hospital Medical Center,
Tucson, AZ
Diagnostic Radiology
University of Arizona Affiliated
Hospitals, Tucson, AZ

Gabianelli, Eugene Benedict
St. Louis, MO
B.A., Dartmouth College, '81
Transitional
Illinois Masonic Medical Center,
Chicago, IL
Ophthalmology
University of Chicago,
Chicago, IL

Gibson, Laverne Elspeth
Silver Spring, MD
B.S., Massachusetts Institute of
Technology, '83
Obstetrics and Gynecology
Wayne State University/Detroit
Medical Center, Detroit, MI

Giles, Wayne Howard A.
Malvern, PA
B.A., Washington University, '83
Internal Medicine
University of Alabama Hospitals,
Birmingham, AL

Gooden, Earl Anthony
Bronx, NY
B.A., Boston University, '81
Psychiatry
Barnes Hospital, St. Louis, MO

Greene, Kelly Elizabeth
Longmont, CO
B.A., Carroll College, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Gretch, Gary Joseph
Great Falls, MT
B.S., College of Great Falls, '83
Internal Medicine
Oregon Health Sciences
University, Portland, OR

Haden, David Samuel
Elkton, VA
B.S., College of William and
Mary, '82
Internal Medicine
Washington Hospital Center,
Washington, DC

Hanaway, Patrick James
DePere, WI
B.S., University of Wisconsin,
Madison, '81
Missouri Department of Health,
St. Louis, MO

Izen, Brenda Gail
Chatham, IL
B.A., University of Houston, '72;
M.O.T., Texas Womens
University, '77
Family Practice
St. John's Mercy Medical Center,
St. Louis, MO

Jick, David Ethan
St. Louis, MO
A.B., Washington University, '82
Internal Medicine
University of California, Los
Angeles Medical Center, Los
Angeles, CA

Johnson, Douglas Jay
Carterville, IL
B.S., Purdue University, '83
Family Practice
Naval Regional Medical Center,
Charleston, NC

Johnson, Yvette Renee
Boston, MA
B.S., Tufts University, '82
Pediatrics
Children's Hospital at Washington
University, St. Louis, MO

Joyce, Michael Edward
Wexford, PA
B.A., Miami University, '81
General Surgery
Barnes Hospital, St. Louis, MO
National Institutes of Health,
Washington DC
Orthopedic Surgery
Barnes Hospital, St. Louis, MO

Kilo, Charles Michael
Kansas City, MO
B.S., University of Missouri,
Kansas City, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Kliwer, Peter James
Corvallis, OR
B.S., Oregon State University, '82
Internal Medicine Preliminary
University of Washington,
Seattle, WA

Layton, Brent Thomas
Salt Lake City, UT
B.A., Weber State College, '83
Diagnostic Radiology
Vanderbilt University Hospital,
Nashville, TN

Lee, Philip Curtis
Hillsborough, CA
B.A., University of California,
Berkeley, '81
Internal Medicine
Stanford University Hospital,
Stanford, CA

Little, Jesse Samuel, Jr.
Santa Fe, NM
Oklahoma University
Surgery Preliminary
Urology
Indiana University Medical
Center, Indianapolis, IN

Little, Susan Janet
St. Louis, MO
B.A., Carleton College, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

MacKendrick, William Phillip
Hotchkiss, CO
B.A., University of Colorado,
Boulder, '83
Pediatrics
Children's Memorial Hospital,
Chicago, IL

McManis, Susan Elizabeth
Lanham, MD
B.S., University of Maryland, '83
Psychiatry
Wilford Hall USAF Medical
Center, San Antonio, TX

Mahaffy, Sara Ann
San Mateo, CA
B.S., Washington University, '83
Pediatrics
Children's Memorial Hospital,
Chicago, IL

Major, Godfrey Wilshere
Eleuthera, Bahamas
B.A., Canisius College, '83
Obstetrics and Gynecology
Tulane University School of
Medicine, New Orleans, LA

Makeever, Robert Mark
Normal, IL
B.S., University of Illinois,
Urbana, '79
Family Practice
St. Paul-Ramsey Medical Center,
St. Paul, MN

Manerikar, Sucheta Dattatray
Park Forest, IL
B.S., Washington University, '83
Psychiatry
University of Illinois Hospital,
Chicago, IL

Martin, Stanley Barlow
St. Louis, MO
B.A., Amherst College, '83
Surgery Preliminary
The New York Hospital, New
York, NY
Neurosurgery
The New York Hospital (Cornell),
New York, NY

Matossian, Viken Raffi
Bethesda, MD
B.A., Swarthmore College, '83
Psychiatry
Barnes Hospital, St. Louis, MO

Meyer, Cristopher Andrew
Cincinnati, OH
B.S., University of Virginia, '83
Internal Medicine
Tripler Army Medical Center,
Honolulu, HI

Mistry, Dinu Gertrud
Champaign, IL
A.B., University of Illinois,
Urbana, '82
Surgery
University of Texas Medical
School, Houston, TX

Montie, Gerald Lee
Green Bay, WI
B.A., University of Wisconsin,
Madison, '82
Carondelet Family Care Center,
St. Louis, MO

Mumford, Margaret Crane
Plymouth, NH
B.A., Williams College, '83
Obstetrics and Gynecology
University of Louisville School of
Medicine, Louisville, KY

Naureckas, Edward Theodore
Gurnee, IL
B.S., Marquette University, '83
Internal Medicine
Michael Reese Hospital,
Chicago, IL

Nguyen, Tramy Thi
Irvine, CA
B.S., University of California,
Irvine, '83
Pediatrics
Children's Hospital at Washington
University, St. Louis, MO

Nickles, George Bruce
Wheeling, WV
B.A., West Virginia University,
'72; D.D.S., '78
Emergency Medicine
University of Louisville School of
Medicine, Louisville, KY

Nordlund, Julia C.
Charlottesville, NC
B.A., University of Virginia, '80
Anatomic Pathology
Barnes Hospital, St. Louis, MO

Noren, Richard Lowell
Highland Park, IL
B.A., Washington University, '83
Surgery Preliminary
Rush-Presbyterian-St. Luke's
Medical Center, Chicago, IL

Nouhan, Regina Marie
St. Louis, MO
B.A., University of Virginia, '83
Surgery
Jewish Hospital at Washington
University, St. Louis, MO

Ohrt, Colin K.
North Mankato, MN
B.A., Gustavus Adolphus, '84
Internal Medicine
University of Texas Southwestern
Medical School, Dallas, TX

Onder, Robert Frank, Jr.
St. Louis, MO
B.A., Washington University, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Orgel, Laurie Spellman
St. Louis, MO
B.A., Brandeis University, '74;
M.S.W., Boston College, '78
Psychiatry
Sheppard Enoch Pratt Hospital,
Baltimore, MD

Palma, Anne Tilly
Costa Mesa, CA
B.S., University of California,
Irvine, '83
Internal Medicine
Valley Medical Center
Fresno, CA

Pennock, Gregory Dean
Phoenix, AZ
B.S., University of Idaho, '83
Internal Medicine
University of Arizona Affiliated
Hospitals, Tucson, AZ

Perry, Mark Alan
Kansas City, MO
B.A., University of Missouri,
Columbia, '83
Diagnostic Radiology
Barnes Hospital, St. Louis, MO

Phillips, Christopher Jay
Dayton, OH
B.S., University of Dayton, '83
Surgery Preliminary
Good Samaritan Medical Center,
Cincinnati, OH
E.N.T.
University of Iowa, Iowa City, IA

Plautz, William Andrew
Indianapolis, IN
B.S., University of Michigan, Ann
Arbor, '82
Family Practice
University of California, San
Francisco, San Francisco, CA

Pluard, Timothy Joseph
Evergreen Park, IL
B.S., Washington University, '83
Internal Medicine
University of Texas Southwestern
Medical School, Dallas, TX

Pryor, Betty Lea Davis
Hattiesburg, MS
B.S., University of Southern
Mississippi, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Puscheck, Elizabeth Ella
Alexandria, VA
B.A., University of Chicago, '83
Obstetrics and Gynecology
Barnes Hospital, St. Louis, MO

Rayne, Susan Christie
Pittsburgh, PA
B.M., Indiana University,
Bloomington, '79
Pathology
St. John's Mercy Medical Center,
St. Louis, MO

Reyonlds, Craig Harry
Hollywood, FL
A.B., Washington University, '83
Internal Medicine
Barnes Hospital, St. Louis, MO

Rogero, Grant William
Lodi, CA
B.S., University of California, Los
Angeles, '83
Internal Medicine Preliminary
Valley Medical Center,
Fresno, CA
Diagnostic Radiology
Stanford University Hospital,
Stanford, CA

Rokusek, Laura Adele
Rockford, IL
B.A., Washington University, '83
Internal Medicine
University of Washington
Affiliated Hospitals, Seattle, WA

Ross, Barry James
Belle Fourche, SD
B.S., Black Hills State
College, '82
Internal Medicine
University of Missouri, Kansas
City Affiliated Hospitals, Kansas
City, MO

Rumbarger, Tara Ann
Hagerstown, MD
B.A., Johns Hopkins
University, '82
Post Graduate Fellow in
Radiology
Howard Hughes Medical Institute,
Washington University,
St. Louis, MO

Salimpour, Pejman
Woodland Hills, CA
B.S., University of California,
Los Angeles, '83
Pediatrics/Primary
Harbor-UCLA Medical Center
Torrance, CA

Sandiford, Patrick Bertram
Montreal, Canada
B.S., McGill University, '83
Internal Medicine
Barnes Hospital, St. Louis, MO
Scavone, Barbara Mary
Glen Ellyn, IL
A.B., B.S., University of Illinois,
Urbana, '82
Internal Medicine
Jewish Hospital at Washington
University, St. Louis, MO

Schmidt, Norman Dagobert
Lodi, CA
B.S., University of California,
Davis, '82
Family Practice
San Joaquin General Hospital
French Camp, CA

Smith, Peter Lloyd
Fort Wayne, IN
B.S., University of Notre
Dame, '83
Transitional
St. John's Mercy Medical Center,
St. Louis, MO
Diagnostic Radiology
Massachusetts General Hospital,
Boston, MA

Smith, Ronald Maurice
Fargo, ND
B.S., University of Minnesota, '80
Orthopedics
St. Louis University Hospital,
St. Louis, MO

Stevenson, Linda K.
Hayti, SD
B.S., University of Minnesota, '83
Emergency Medicine
University of Arizona Affiliated
Hospitals, Tucson, AZ

Sullivan, Carolyn Ann
West Babylon, NY
A.B., Washington University, '83
Pediatrics
Walter Reed Medical Center,
Washington, DC

Thompson, Paul Alan
San Jose, CA
B.S., Washington University, '83
Family Practice
Wausau Hospital Center,
Wausau, WI

Tolan, Robert Warren, Jr.
Kokomo, IN
A.B., Indiana University, '82;
M.A., '83
Pediatrics
Indiana University Medical
Center, Indianapolis, IN

Watson, Yasmira Ivett
St. Louis, MO
B.A., Washington University, '83
Internal Medicine
Jewish Hospital at Washington
University, St. Louis, MO

White, Gary Michael
Redding, CA
B.A., University of California,
San Diego, '83
Internal Medicine
Jewish Hospital at Washington
University, St. Louis, MO

Wiggins-Allen, Trina Rene
Oakland, CA
B.A., Stanford University, '82
Pediatrics
St. Louis University Hospital,
St. Louis, MO

Wilborn, Jerome
Detroit, MI
B.S., University of Michigan, Ann
Arbor, '83
Internal Medicine
University of Illinois Hospital,
Chicago, IL

Wilson-Marshall, Marie
Markham, IL
B.A., University of Chicago, '83
Pediatrics
University of Chicago Medical
Center, Chicago, IL

Wolfson, James Kenneth
Bethesda, MD
B.A., University of Chicago, '82
Psychiatry
Barnes Hospital, St. Louis, MO

Zager, Scott Anthony
Woodland Hills, CA
B.S., University of California,
Los Angeles, '83
Internal Medicine
University of California, San
Diego, CA

Third-Year Class 1986-87

Andersen, Peter Edward
Sherwood, OR
B.S., University of Oregon, '84

Anderson, Milton Webster
White Hall, MD
B.A., Washington University, '84

Androff, Mary Elizabeth
Des Plaines, IL
B.S., University of Illinois,
Urbana, '84

Armstrong, Brian Athan
Spring, TX
B.A., Pittsburgh State
University, '84

Bane, Charles Leo
Arrowsmith, IL
B.S., University of Illinois,
Urbana, '84

Batanghari, Budianto Teddy
Jakarta, Indonesia
B.A., University of California,
San Diego, '84

Bautista, Joel Olarte
Moberly, MO
B.A., Washington University, '83

Bell, Richard Carl
Houston, TX
B.A., Northwestern
University, '84

Bloomberg, Judy Ferer
St. Louis, MO
B.A., Northwestern
University, '84

Borowsky, Steven Jay
St. Louis, MO
A.B., Harvard College, '83

Botney, Richard
Tarzana, CA
B.S., University of California,
Berkeley, '77

Bowman, Steven Howard
Chicago, IL
B.A., Stanford University, '84

Buggs, Mablene
St. Louis, MO
A.B., Brown University, '84

Campbell, Mary Louise
Concord, MA
B.A., Wellesley College, '84

Castelbaum, Arthur Jay
West Caldwell, NJ
B.A., Washington University, '84

Chandler, Charles Francis
Yuba City, CA
B.S., University of California,
Davis, '76

Chor, Paula Jean
Fairview Heights, IL
A.S., Belleville Area College, '78;
B.S., Southern Illinois University
at Edwardsville, '84

Clyne, Patrick Stephen
Waukegan, IL
B.A., Illinois Wesleyan
University, '84

Constantino, John Nicholas
St. Louis, MO
B.S., Cornell University, '84

Corwin, Claudia Lynn
New York, NY
B.A., Wellsley College, '83

Cranshaw-Mink, Janet Louise
Wellesley, MA
B.A., Wesleyan University, '82

D'Amico, James Michael
Springfield, OH
B.S., Marquette University, '72;
D.D.S., Marquette School of
Dentistry, '76

DiValerio, Richard Michael, Jr.
Orchard Park, NY
B.S., University of Notre
Dame, '84

Dohe, Emily Karen
Aurora, CO
BA., Colorado College, '84

Dweck, Eli F.
Hollywood, FL
B.A., University of Pennsylvania,
Philadelphia, '84

Dyer, Laura Ella
Paducah, KY
B.A., Duke University, '84

Eichler, Marc Edward
Rockville, MD
B.S., University of Michigan, '83

Eisenbeis, John Francis
Warson Woods, MO
B.S., University of Notre
Dame, '84

Elliott, Jeffrey Leigh
Cliffside Park, NJ
B.A., Washington University, '84

Filmyer, William George, Jr.
Philadelphia, PA
B.S., M.S., Tufts University, '81;

Forsen, James William, Jr.
St. Louis, MO
A.B., Princeton University, '83

Forsyth, Christopher Burton
Clayton, MO
B.A., University of Missouri,
St. Louis, '82

Frenkel, Neal Allen
Tulsa, Oklahoma
B.A., Yale University, '84

Fuhlbrigge, Anne Johnston
Rochester, MN
B.S., University of Wisconsin,
Madison, '83

Gassner, Lawrence Phillip
Woodland Hills, CA
B.A., Duke University, '79

Godet, Andre Scruggs
Nassau, Bahamas
B.Sc., Morehouse College, '83

Godfrey, Wayne Russell
Los Altos, CA
B.A., University of California,
Santa Barbara, '82; M.S., Stanford
University, '83

Graves-Quayle, Kimberly Sue
Jefferson City, MO
B.A., University of Missouri,
Columbia, '84

Hack, Howard Mark
Fox Point, WI
B.A., University of
Pennsylvania, '84

Hagge, Rosalie Paisley
Long Beach, CA
B.S., Washington University, '83

Hatley, Thomas Edward
Granite City, IL
B.A., Southern Illinois University
at Edwardsville, '76

Hillsley, Russell Edward
Potomac, MD
B.S., Virginia Polytechnic
Institute and State University, '84

Hoehne, Terry Glenn
St. Louis, MO
B.A., Central Methodist
College, '84

Inhofe, Perry Dyson II
Tulsa, OK
B.S., Duke University, '84

Itson, Janice Marie
Chicago, IL
B.A., University of Chicago, '84;
M.S., '86

Jackson, Jeffrey Layton
Kansas City, KS
B.S., University of Kansas, '83

Jones, Leroy Alphonso
Brooklyn, NY
B.A., University of Colorado,
Boulder, '83

Kaniecki, Robert Gerard
Pittsburgh, PA
B.S., University of Notre
Dame, '84

Kim, Thomas Aquinas
Hopkinsville, KY
B.A., Michigan State
University, '84

Kitchen, Brenda Joyce
Kansas City, MO
S.B., Massachusetts Institute of
Technology, '83

Kleerup, Eric Christopher
Villa Park, CA
B.S., Stanford University, '84

Kriesel, John Douglas
Lake Bluff, IL
B.S., University of Illinois,
Urbana, '83

Kurose, George Alan
Norwalk, CT
B.A., Wesleyan University, '83

Lambrecht, Andrew John
Greenfield, WI
B.A., Washington University, '83

Landes, Andrew Bruce
Boca Raton, FL
B.A., Wesleyan University, '84

Lewis, Stacy Kay
Seymour, IN
B.A., Washington University, '84

Lim, Yin Yin
San Francisco, CA
B.A., Washington University, '80

Lyketsos, Kostas George
Athens, Greece
B.A., Northwestern
University, '84

McCarthy, Margaret Linton
St. Louis, MO
B.A., University of Missouri,
St. Louis, '83

McKenzie, Margaret Louisa
Portland, OR
B.S., Portland State University,
'81; M.S., Howard University, '84

Magee, Ronald Ray
Dallas, TX
B.S., Washington and Lee
University, '84

Malane, Michelle Selina
Cheshire, CT
B.A., Brandeis University, '81

Miller, Boyd Donald
Waukesha, WI
B.A., Lawrence University, '84

Minger, Susan Elizabeth
Oakland, CA
B.A., University of
San Francisco, '78

Misick, Lofton Nathaniel
Turks/Caicos Island, West Indies
A.A., Miami Dade Community
College, '82; B.S., Howard
University, '83

Moellenhoff, Sharon Lynn
St. Louis, MO
B.A., Vanderbilt University, '84

Morishima, Chihiro
Des Plaines, IL
B.A., Washington University, '84

Moulton, Michael Lowell
Brunswick, MD
B.A., Augustana College, '84

Muszynski, Cheryl Ann
Southfield, MI
B.A., Kalamazoo College, '84

Ockner, Daniel Matthew
Shaker Heights, OH
A.B., Washington University, '84

Optican, Robert Joseph
St. Joseph, MO
B.A., Duke University, '83

Parks, David Jay
Long Beach, NY
B.S., State University of New York, Binghamton, '83

Peterseim, David Scott
Nashville, TN
A.B., Duke University, '84

Pieper, Stephen James
St. Louis, MO
A.B., Washington University, '83

Plumb, Mark David
Pewaukee, WI
B.S., Washington University, '84

Poorman, Jay Clifford
Portland, OR
B.S., Oregon State University, '84

Quast, Robert Francis
Brookfield, WI
B.A., St. Louis University, '84

Reed, Philip Andrew
Webster Groves, MO
B.A., Carleton College, '84

Rha, Janice Jung
Granada Hills, CA
B.S., Seoul National University, '74; B.A., California State University, Northridge, '84

Rinehart, Heidi Fedrizzi
New Britain, CT
B.S., St. Lawrence University, '84

Romanelli, Matthew Frederick
Dix Hills, NY
B.A., Yale University, '83

Ross, Albert Beasley
Chicago, IL
B.A., Washington University, '84

Rubin, William David
Santa Monica, CA
B.S., University of California, Berkeley, '84

Rudnick, Judith Renee
Croton, NY
B.A., Johns Hopkins University, '84

Scharenberg, Karen Lisa
West Lafayette, IN
B.A., Indiana University, '84

Shaikewitz, Samuel T.
St. Louis, MO
B.S., Stanford University, '84

Sheen, Vida Dee
Lexington, KY
B.S., University of Kentucky, '84

Shen, Jason
Orinda, CA
A.B., Washington University, '84

Shopper, Glenn Kenneth
Clayton, MO
B.A., Wesleyan University, '83

Smart, Stephen John
Burbank, IL
B.S., Washington University, '84

Smith, Gregory Alan
Yellow Springs, OH
B.S., Indiana University, '84

Sonin, Andrew Howard
Plantation, FL
B.A., Washington University, '84

Stumbo, Elizabeth Ann
Orinda, CA
B.A., Carleton College, '83

Talley, Audrey Rose
East Meadow, NY
B.A., Boston University, '82

Taylor, Stephan Floyd
Cincinnati, OH
B.A., Northwestern University, '80

Teicher, Joel Robert
St. Louis, MO
B.A., University of Michigan, Ann Arbor, '84

Theodoro, David Alan
Festus, MO
B.S., Washington University, '84

Thompson, Geoffrey Graeme
San Francisco, CA
B.A., University of California, San Diego, '79

Thornton, Michael Kent
Bridgeton, MO
B.A., University of Missouri, St. Louis, '84

Tiffany, Brian Robert
Oneco, FL
B.S., Bob Jones University, '84

Turrill, Mark
Glendale, CA
B.A., University of Southern California, '83

Walker, Eleanor Maud
Brooklyn, NY
B.S., University of Notre Dame, '84

Walker, William Victor
Mesa, AZ
A.B., Washington University, '82

Watling, David Lee
Lansing, MI
B.S., Michigan State University, '80

Watson, Mark Jay
La Jolla, CA
B.S., San Diego State University, '84

White, Gordon Leigh
Kansas City, MO
B.A., Washington University, '83

Wilson, Alan D.
Hartford, KS
B.S., Emporia State University, '83

Wilson, John Richard
Oakland, CA
B.A., Washington University, '84

Winfrey, Mae Millicent
Lexington, VA
B.A., Duke University, '84

Yeager, Terry Douglas
Sioux Falls, SD
B.A., Augustana College, '80; M.S., University of Nebraska, Lincoln, '84

Zabel, Kenneth Michael
Pittsburg, KS
B.S., Graceland College, '84

Zohner, Jeffrey Robert
St. Louis, MO
B.A., Wheaton College, '77

Second-Year Class 1986-87

Adams, Kenneth Allen
Springfield, IL
B.S., University of Illinois, Urbana, '85

Adelt, Gabriela Hannelore
Racine, WI
B.A., Washington University, '84

Ali, Nayyer Zaman
Long Beach, CA
B.A., Stanford University, '85

Askins, Kelly Marsh
Columbus, IN
B.A., Washington University, '85

Aves, Teodulo Manuel
Parson, KS
B.A., St. Louis University, '85

Balis, Fred Jeffrey
Wallingford, PA
B.S., University of Vermont, '81; M.S., Cornell University, '85

Bartholow, Timothy Lisle
Muscatine, IA
B.A., Drake University, '84

Batchelder, Andrew Graham
Fairbault, MN
B.A., St. Olaf College, '85

Berger, John Torrey III
St. Louis, MO
B.A., University of Virginia, '85

Bischoff, James Kenneth
Los Alamitos, CA
B.S., Cornell University Statutory Colleges, '85

Carpenter, Michael Wayne
St. Louis, MO
B.S., University of Missouri, Rolla, '79

Cary, Matthew Glen
Aurora, Colorado
B.A., Pomona College, '85

Cho, Nancy K.
St. Louis, MO
B.S., Yale University, '85

Clancy, Cornelius Joseph
Somerset, NJ
B.A., Johns Hopkins
University, '84

Clark, Kevin D.
Pittsburgh, PA
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Davis, '85

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B.A., Princeton University, '85

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Sward-Lamberth, Susan L.
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Fullerton, '85

Teckman, Jeffrey Harry
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Thompson, Brent Craig
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B.A., Concordia College, '85

Thornton, Melvin Henry II
Warrensville Heights, OH
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Tung, Jeany
Towson, MD
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Vaughan, Thomas Edward
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B.A., Washington University, '85

Watchmaker, Greg Peter
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B.S., University of Wisconsin,
Madison, '85

Weissman, Jacalyn Elise
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B.A., Washington University, '85

White, Jacqueline Gay
Anniston, AL
B.S., Spelman College, '85

Zobel, Mark Steven
Kansas City, MO
B.S., Washington University, '85

First-Year Class 1986-87

Alexander, Todd David
Lancaster, WI
B.A., Indiana University,
Bloomington, '85; M.S., University
of Illinois, Chicago, '86

Allen, Jennifer Ann
Boise, ID
B.A., Northwestern
University, '86

Amatruda, James Francis
Woodbridge, CT
A.B., Harvard University, '86

Anast, William Stuart
Brookline, MA
B.A., Northwestern
University, '80

Apicella, Peter Lee
Salem, OH
B.S., John Carroll University, '86

Arrington, Dexter Edwin
Grambling, LA
B.S., Brown University, '83

Baker, Kirsten Magdaline
Holmdel, NJ
A.B., Washington University, '86

Bellafore, Frank Jerome
Kansas City, MO
B.S., Creighton University, '86

Benevento, William Joseph
Saratoga, CA
A.B., Stanford University, '86

Benfield, Susan Ann
Needham, MA
B.S., Yale University, '84

Bowlin, David Lewis
Minneapolis, MN
B.A., University of Chicago, '85

Brard, Gyan Singhsidhu
Piedmont, CA
B.A., University of California,
Santa Barbara, '86

Carey, John Patrick
Louisville, KY
A.B., Washington University, '85

Carmichael, Stanley Thomas, Jr.
Westlake, CA
B.S., University of California,
Los Angeles, '86

Chiara, David Carl
Redding, CA
B.S., University of California,
Davis, '84

Cizek, Greg Robert
Glencoe, MO
B.S., Northwestern University, '86

Cohen, Jodi Melissa
Huntington Station, NY
A.B., Washington University, '86

Collum, Steven Edward
Lee's Summit, MO
A.B., Washington University, '86

Curran, Michael Patrick
Turnersville, NJ
A.B., Washington University, '86

Dassow, Paul Larry
Loveland, CO
B.S., University of Colorado,
Boulder, '86

Dauer, William Todd
Whittier, CA
B.S., Duke University, '86

Drucker, David Wayne
Dix Hills, NY
B.S., Duke University, '86

Epstein, Howard Robert
N. Massapeque, NY
A.B., Washington University, '86

Evans-Sanders, Leigh Virginia
Tustin, CA
A.B., Occidental College, '82
Fischer, Andrea Elizabeth
Hannibal, MO
A.B., University of Missouri,
Columbia, '85
Fremling, Mitchell Alex
Sunnyvale, CA
B.S., Washington University, '86
Freund, Jerome Robert
Lakeland, FL
B.A., Westminster College, '62;
M.Div., Union Theological
Seminary, '68; M.S., University of
Florida, '70; Ph.D., '72
Gander, Todd Richardson
Lakewood, CO
B.S., Yale University, '85
Gerber, Adam Jeffrey
Ft. Lauderdale, FL
A.B., Harvard University, '86
Gibbs, George Garing
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B.S., California Institute of
Technology, '86
Gossum, Robin Sann
Memphis, TN
B.S., Rhodes College, '86
Greenberg, Deborah Lynn
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B.S., Brown University, '85
Grills, Jeffrey Dale
Alton, IL
B.S., University of Illinois,
Urbana, '86
Gupta, Babu Venkatesh
Bluefield, WV
B.S., Duke University, '86
Guyton, Christina Lynn
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A.B., Princeton University, '86
Hakala, Brian Everest
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A.B., Harvard College, '86
Hall, Curtis Ray
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B.A., Baylor University, '86
Harrington, Gary Clayton
Baltimore, MD
B.S., Howard University, '84
Heller, Andreas Ernst
Baden-Baden, West Germany
B.A., University of California,
Santa Cruz, '86
Hill, Maria LaBonette
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Hock, Karl Glenn
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A.B., Dartmouth College, '86
Holtz, Anita Jean
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Horwitz, Daniel Scott
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B.A., Duke University, '86
Houston, Darryl Lynn
Boonton, NJ
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Hsie, Tadd Taching
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B.A., University of California,
Berkeley, '86
Hwang, Paul Tzen-Chou
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A.B., Washington University, '86
Jasmer, Robert Murray
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Jaye, David Lawrence
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Kaskowitz, Lawrence Steven
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Dame, '86
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Urbana, '86

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Technology, '86

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Weston, William Milton
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B.A., Brown University, '85

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SUMMARY OF STUDENTS IN THE SCHOOL OF MEDICINE, 1986-87

Doctor of Medicine and Doctor of Philosophy Degrees

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SCHOOLS OF WASHINGTON UNIVERSITY

All schools are located at One Brookings Drive, St. Louis, Missouri 63130, except Medicine (660 South Euclid Avenue, 63110) and Dental Medicine (4559 Scott Avenue, 63110). A University-sponsored shuttle bus travels between the main campus and the medical/dental campus every 20 minutes.

The College of Arts and Sciences

*The Graduate School of Arts
and Sciences*

*The School of Engineering and
Applied Science*

The Sever Institute of Technology

*The School of Technology and
Information Management*

The School of Architecture

*The School of Business and Public
Administration*

*The Graduate School of Business
Administration*

The School of Fine Arts

The School of Social Work

The School of Law

The School of Medicine

The School of Dental Medicine

University College

The Summer School

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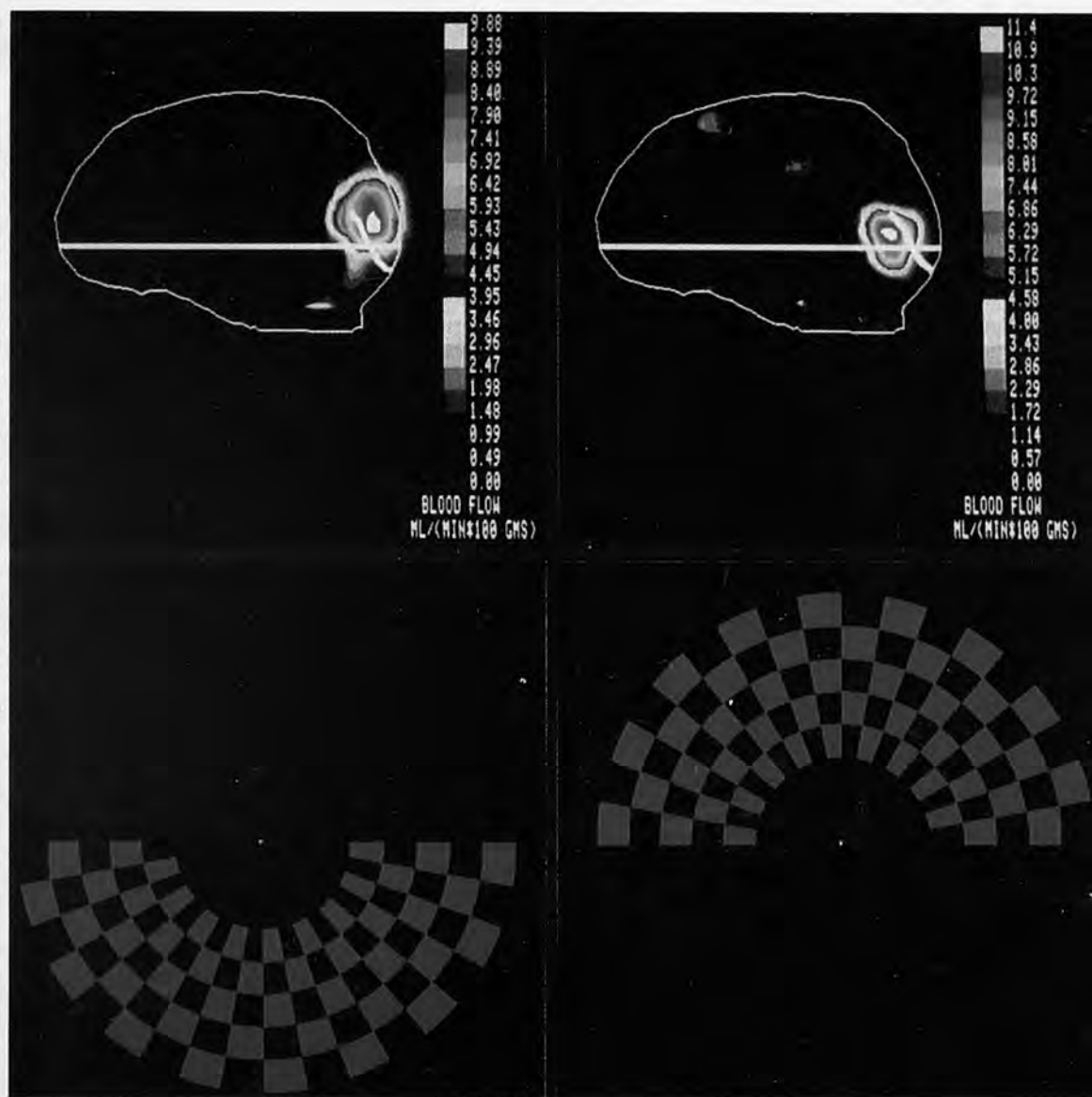


Washington University Medical Campus

- 92. Barnard Hospital
- 93. Barnes Hospital
- 94. Barnes Service Building
- 95. Biomedical Computer Laboratory
- 96. Cancer Research Building
- 97. Central Institute for the Deaf (CID)
- 98. CID Clinic/Research Building
- 99. CID Residence Hall
- 100. Central Medical Building
- 101. Children's Hospital (original building)
- 102. Children's Hospital (new)
- 103. Clinical Sciences Research Building
- 104. East Building
- 105. East Pavilion
- 106. Euclid Power Plant
- 107. 4511 Forest Park Medical Center
- 108. Garage, Barnes Plaza
- 109. Garage, Barnes (Taylor Ave.)
- 110. Garage, Children's Hospital

- 111. Garage, Jewish Hospital
- 112. Garage, Queeny Tower
- 113. Garage, School of Medicine
- 114. Health Administration
- 115. Internal Auditors Building
- 116. Internal Medicine Business Office
- 117. Jewish Hospital
- 118. Irene Walter Johnson Institute of Rehabilitation
- 119. Rand Johnson Building
- 120. Library Annex
- 121. Mallinckrodt Institute of Radiology
- 122. Maternity Hospital
- 123. McDonnell Science Building

- 124. McMillan Hospital Building
- 125. North Building
- 126. Nurses Residence
- 127. Occupational Therapy Program
- 128. Old Shriners Hospital
- 129. Spencer T. Olin Residence Hall
- 130. Personnel Office, School of Medicine
- 131. Peters Building
- 132. Queeny Tower
- 133. Renard Hospital
- 134. School of Dental Medicine
- 135. Shoenberg Pavilion
- 136. Shoenberg Research Building
- 137. Shoenberg School of Nursing
- 138. South Building
- 139. Steinberg Building
- 140. Storz Building—Medical Care Group
- 141. West Building
- 142. West Pavilion
- 143. Wohl Clinic
- 144. Wohl Hospital Building
- 145. Wohl Research Laboratory
- 146. Yalem Research Building



Positron emission tomography (PET) is a technique largely pioneered at Washington University School of Medicine by Michel M. Ter-Pogossian, Ph.D., professor of radiation sciences, and his co-workers. Today, the School is considered to be the largest PET center in the world. PET combines the administration of compounds labeled with radioactive positron emitting nuclides with the imaging of their distribution in the subject under study. The imaging device consists of a circular array of radiation-sensing detectors and of a computer and peripherals. Each detector's input is like the film exposure of a single camera. The computer combines the products of all the detectors into a single image. To undergo a PET scan, the subject is placed in the scanner, then is either injected with or inhales molecules that have been labeled with a radioactive tag. These molecules are incorporated into the body's

biochemical traffic and often congregate preferentially in areas where their biological activity is in demand. The radiation they emit is picked up by the detectors and converted to electrical impulses that the scanner's computer reconstructs as an image. Using PET, researchers at Washington University School of Medicine have perfected a way to trace sensory impulses to their precise destination in the brain. The two PET images above show the different brain regions activated when a stimulus is shown only to the lower visual field (left) or to the upper visual field (right). The Washington University investigators developing PET techniques for brain mapping are led by Marcus E. Raichle, M.D., professor of neurology and radiology. The above image was supplied by Peter T. Fox, M.D., assistant professor of neurology and radiology, a member of the investigative team.

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